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ABSTRACT

This publication details the proceedings of a Primary Science Planning Workshop held in Manila, Philippines from June 24-28, 1969. The major goal of this workshop was to develop a course to train teachers and teacher training specialists in elementary education for each country participating. These individuals would play primary roles in introducing modern elementary education methods and appropriate content in science into their countries and help prepare teachers to implement the new curricula and methods. A detailed description of the Primary Science Training Course produced by this workshop is provided. Supporting professional documents are included. Information in the Appendices includes: the workshop program and proceedings, a list of participants, copies of addresses presented at the initial session, a bibliography of RECSAM (Regional Centre for Education in Science and Mathematics) reports, and press communiques. (BT)

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Member Countries :

INDONESIA
MALAYSIA
PHILIPPINES
SINGAPORE
THAILAND
VIETNAM

REPORT

OF THE

PRIMARY SCIENCE PLANNING WORKSHOP

Convened by
the Interim Project Office of the SEAMES Regional Centre
for Education in Science and Mathematics, Penang, Malaysia,
in collaboration with the Department of Education,
Manila, of the Republic of the Philippines.

RECSAM Project Office,
c/o Malayan Teachers' College,
Penang, Malaysia.

A.I.D.
Reference Center
Room 1656 NS

June 24 - 28, 1969
Manila
Republic of the Philippines

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TABLE OF CONTENTS

	Page No.
SUMMARY	1 - 2
BACKGROUND INFORMATION	3 - 4
DESCRIPTION OF ELEMENTARY SCIENCE TRAINING COURSE	5
OBJECTIVES OF WORKSHOP	6
MAJOR RESULTS & RECOMMENDATIONS	7 -16
SUPPORTING PROFESSIONAL DOCUMENTS	
1. Primary Science Planning Workshop - Background Material - Primary Science - A Process Approach	17
2. Abstracts of other relevant planned RECSAM Projects	18 -25
3. Working Paper No. 1 - Modern Methods in Teaching & Evaluating Elementary Science	26
4. Working Paper No. 2 - Suggested Framework for Planning Course	27
5. Working Paper No. 3 - A Six Month Course In Elementary Science	28 -31
6. Discussion Paper No. 1 - A Model For a Comprehensive In-Ser ice Training Programme for Science Curriculum Innovation -by Charles M. Weller.	32 -39
7. Discussion Paper No. 2 - Some Thoughts on the Planning of the training course on modern methods in Teaching and Evaluating elementary/priamry science - by Dr. R. Salinger.	40 -42
8. Discussion Paper No. 3 - by Mr. Hee Hoi Choo, Malaysia.	43 -44
9. Discussion Paper No. 4 - A Suggested Plan For Administration Of Concurrent Projects - by Mr.H.F. Foncannon	45 -47
10. Discussion Paper No. 5 - Guide In The Preparation Of Elementary School Science Materials - by Prof. P.P. Jesuitas.	48 -57

TABLE OF CONTENTS

	Page No.
APPENDICES	
A - Programme Of Primary Science Planning Workshop	59
B - Proceedings Of The Primary Science Planning Workshop	60 - 64
C - List Of Participants	65
D - Organising Committee	66
E - Addresses by	
1. Hon. Juan L. Manuel	67 - 68
2. Dr. Liceria B. Soriano	69 - 70
3. Dr. Dolores Hernandez	71 - 73
F - Background Data on RECSAM - A Brief Description Of The Major Functions Of The SEAMEC Regional Centre For Education In Science & Mathematics.	74 - 77
G - History Of RECSAM Development	78 - 80
H - Bibliography Of RECSAM Reports	81 - 82
I - Report Distribution	83
J - Press Communique	84

ON SCIENCE & ART IN RELATION TO EDUCATION

" THERE ARE A GREAT MANY PEOPLE WHO IMAGINE THAT ELEMENTARY (SCIENCE) TEACHING MIGHT BE PROPERLY CARRIED OUT BY TEACHERS PROVIDED WITH ONLY ELEMENTARY KNOWLEDGE - LET ME ASSURE YOU THAT THAT IS THE GREATEST MISTAKE IN THE WORLD"

Thomas Huxley
1882

REPORT OF THE PRIMARY SCIENCES WORKSHOP

SUMMARY

This Workshop on Primary Science is one of a series planned by RECSAM* to develop solid professional bases for future science and maths training courses planned for the Centre. Because of time lags between initial plans and eventual course implementation, and in the interest of ensuring highest quality results, RECSAM plans to hold similar workshops on each course before it is given for the first time.

This Workshop report supplements the earlier work presented in the Centre Development Plan (Reference Appendix H) and reflects the up to date judgement and opinion of leading Primary Science experts from each of the SEAMEC member countries and of outside consultants. It is considered to be a guide to RECSAM for its planning and to the Director of the Primary Science Course to assist him in planning content, methods, and schedule. The philosophy of the Centre, corroborated by the members of this Working Group, provides that the Course Director, selected on the basis of his qualifications for the job, should have considerable flexibility in how to plan and conduct his course. In particular, since the availability of certain needed specialists, e.g. evaluation, educational psychology, etc. is unpredictable at this date, the Director should not be tied to any specific schedule but should be given maximum latitude in the final programming of the course.

It is RECSAM's responsibility, on the other hand, to ensure that the principle of operation of the Centre, as embodied in its Development Plan, are taken into account in all such planning. For example, three key factors in such courses are:

(1) When professionals from outside the Region must be brought in to conduct new courses, regional experts should be assigned as counterparts to work closely with them, with the ultimate intent of making the transition to regionally conducted programs.

(2) Participants at each course will be expected to take definitive action when they return to their home countries. They should, in effect, amplify the Centre's activities through well planned national programs (courses, seminars, lectures, workshops, etc.), thus accomplishing the "multiplier effect" principle noted in the Development Plan. Provision has been made for this part of the effort by the establishment of National Coordinating Committees in each member country. These committees will be responsible for recommending selection of participants, for modifications of courses based on feedback and evaluation information, and for plans for subsequent national implementation efforts.

* A brief description of RECSAM is included in Appendix F for new readers.

(3) The critical problem of teacher/student communication and its consequent effect on teaching effectiveness is also being given considerable attention. This problem is present because very few course instructors have experience in teaching in all or even in a few of the SEAMEC member countries. Different national development policies and objectives, cultures, and educational systems; different terminology, even for such simple things as grade levels; and vastly different student capabilities with the English language means that each new instructor is faced with a much more complex communications problem than he has previously experienced. Dr. Weller's points on the "how" of teaching vs the "what" are relevant here (see Supporting Document A-6). Evidence to date on short courses and seminars held at RECSAM indicates that an orientation guide on these kinds of problems needs to be prepared for future Centre instructors in addition to the professional guides developed through workshops such as this one on Primary Sciences. Action is underway at RECSAM to develop such a guide. In addition, plans are being worked out with the Regional English Language Centre in Singapore to deal specifically with the Language capability problem.

(4) Close coordination with other courses where feasible- In this case with Primary Mathematics Course TCM-1 was suggested in the Development Plan and strongly backed by members of this Workshop.

RECSAM wishes to extend its thanks to the Republic of the Philippines and in particular to Mr. Aurelio Juele, Chairman of the Primary Science Workshop, for the considerable effort in planning and hosting this meeting. RECSAM also extends its appreciation to all the SEAMEC country delegates and other talented participants for making this Workshop a success and a model for future ones. In particular, Dr. Howard F. Foncannon contributed significiently not only in the Workshop itself but in assistance in the preparation of this report.

BACKGROUND

The professional training program and each specific course of RECSAM, directed at training key teacher leaders in science and mathematics in the Elementary and Secondary Schools of the SEAMEC countries* was developed (beginning in July, 1967) through the following steps:-

1) formation of a Scientific Task Force comprised of key science/maths experts, one from each member country

2) a series of Seminars, generally of about three or four days duration, held in each member country in the summer of 1967. These seminars had the primary objective of identifying national biology, chemistry, elementary science, physics and mathematics education problems and needs that could best be solved on a regional basis. Since over five hundred participants took part in the six seminars held, results are believed to truly represent the needs of the countries as they then existed.

3) a subsequent Regional Seminar at RECSAM, in Penang, where subject area specialists (5 from each country) met to outline a preliminary plan of training and research activities for the Centre.

4) subsequent Task Force Meetings to refine and amplify the projects recommended and to propose priorities.

5) final review, modification and abstracting of the projects (some similar ones were consolidated) by RECSAM to insure a common framework of reference, to determine budgets, and to insure that the operating principles of the Centre were met in all projects.

6) each project was then incorporated into the Centre Development Plan* and is described in detail therein.

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* Part I of the Development Plan contains a one page standardised abstract of the Project. Part II (Supporting Documents) contained the detailed project plan as finally developed.

DESCRIPTION OF ELEMENTARY SCIENCE TRAINING COURSE

I. CODE AND TITLE:

TCE-1 Modern Methods in Teaching & Evaluating Elementary Science.

II. DEVELOPED ON THE BASIS OF PROPOSALS:

ET-2, ET-3*

III. OBJECTIVES AND BENEFITS:

This course will train leaders and teacher-training specialists in elementary education for each country participating who can play primary roles in introducing modern elementary education methods and appropriate content to their countries and help prepare teachers to implement the new curricula and methods.

IV. DESCRIPTION:

Under the direction of experienced consultant-teachers, the participants will examine the work done in improving elementary science education in more highly developed countries, study appropriate means of adapting published work or developing new materials to the needs of the countries of the region, study and practice modern teaching methods in elementary science, and study along with modern child-learning theory, appropriate means of evaluating the effectiveness of instruction according to goals sought.

V. PARTICIPANTS:

Four to six teacher-training lecturers of leaders in elementary education from each country, who, on returning home, can help direct the adaptation of new curricula and help train or retrain the teachers needed to implement new curricula.

VI. DURATION AND PHASING:

A six-month course, to be repeated annually so long as regional demand exists. Cycles after the first may need modification in length or content according to experience.

A month of preparation time should precede the course, and an evaluation period follow it. If the course is offered concurrently with other TC-Courses, especially TCM-1, there will be opportunity to co-operate and communicate many problems of mutual interest.

NOTE: Proposed for January to June, 1970.

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* These codes refer to the basic project proposal described in detail in Part II of RECSAM Development Plan (P5/SCMS/14)

OBJECTIVES OF WORKSHOP

The objectives of this workshop, then were simple:-

1) to invite a panel of experts, including at least one primary science expert from each SEAMEC country, plus outside consultants, as available, to review the basic plan for Primary Sciences Course TCM-1 (as abstracted in the previous section) from the standpoint of appropriateness, timeliness and professional adequacy.

2) to amplify and expand the descriptions of the course (content, methodology of teaching and instructional aids [information]) that were previously developed to the point where a document could be developed that would serve as a detailed guide to the future Course Director.

3) to discuss any other points or problems relevant to the success of the program and recommend specific courses of action.

The professional documents resulting from this workshop session - namely those items believed of most help to RECSAM in its initial planning for the Course and to the Course Director - have been included in the body of this report, immediately following. The administrative details of the Workshop and its Proceedings, necessary to a complete understanding of the overall results, are included in the appendices. It is hoped that both the professional portion and the proceedings can serve as guides for future RECSAM workshops. Readers are invited to submit constructive suggestions for improvement of both parts of the report directly to the Project Office in Penang.

The following section, entitled "Major Results and Recommendations", covers the professional and budgetary suggestions of the workshop.

MAJOR RESULTS AND RECOMMENDATIONS

SUMMARY OF WORKSHOP PLAN OF ACTION

With the cooperation of the Republic of the Philippines, the SEAMEC-RECSAM Primary Science Planning Workshop was held in Manila, Philippines from 24th to 28th June, 1969. Mr. Juan L. Manuel, Director of Public Schools and concurrently Undersecretary of Education of the Philippines, addressed the group and declared the workshop open at 9.30a.m. on 24th June at the Bureau of Public Schools. Ohter speakers at the opening ceremony were Dr. Liceria Soriano, Vice Chairman of the Steering Committee RECSAM; and Dr. Dolores F. Hernandez, Chairman of the Republic of the Philippines National Coordinating Committee for RECSAM.

The following were present at the opening ceremony; RECSAM Programme Coordinator, Mr. C. Ganasalingam, Mr. Howard F. Foncannon, Consultant American Academy for the Advancement of Science, Washington, D.C.; Dr. Richard F.P. Salinger, Peace Corps Educational Consultant, Malaysia; Mr. Chandrasena Hettiaratchy, Adviser, Ceylon; delegates from the SEAMEC member participating countries consisting of the Republic of Indonesia, Malaysia, Singapore, Thailand and Philippines; Sister Odiliana, Saint Scholarstica College; Prof. Profirio Jesuitas, University of Philippines; Dr. Luz Sangalang, National Science Development Board.*

During the first plenary session, Mr. Aurelio Juele, Chairman, Primary Science Planning Workshop, gave the orientation on the goals of the planning workshop. He also presented background papers (Supporting Professional Document No. 1) for the workshop. Futhermore, to stimulate thinking and discussion on the goals of the workshop, the Chairman presented working papers** with suggestions regarding the scope of the course, its nature and how it might be scheduled. This presentation was followed by a discussion of the participants' thinking on the value of the project in their respective countries as well as the discussion of the guidelines and goals of the workshop.

In the second work session, the group agreed to consider the following in planning the course.

1. Time allotment for the course
2. Nature of participants
3. Extent of the course
4. Experiences to be emphasised (i.e. relative emphasis of the covered materials)
5. Specifications for facilities to be required.

In addition to the working sessions, the group was also given the chance to observe elementary science classes in session at the University of the Philippines. These classes were using the Elementary School Science materials developed at the Science Education Centre, Philippines. These materials were along modern trends in science education.

After going through about six work sessions, the group produced the following revised description of the course for TCE-1 (Primary Sciences)

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* See Appendix A-3 for full details on all participants.
** See Supporting Professional Documents 3, 4 and 5.

DETAILED DESCRIPTION OF PRIMARY SCIENCE TRAINING COURSE (as modified by workshop)

I. CODE AND TITLE:

TCE-1 Modern Methods of Teaching and Evaluating Elementary Science.

II. DEVELOPED ON THE BASIS OF PROPOSALS:

ET-2, ET-3 (See Supporting Professional Documents A-2)

III. OBJECTIVES OF THE COURSE AND ENVISIONED TRAINEE PRODUCT:

This course will train leaders and teacher-training specialists in elementary education for each country participating who can play primary roles in introducing modern elementary education methods and appropriate content in science to their countries and help prepare teachers to implement the new curricula and methods.

The envisioned trainee product is one who will be ready to perform leadership roles in:-

(a) curriculum development, because he has been given sufficient experiences in the study, selection and adaptation of content and activities in elementary science, a good insight into modern child-learning theory, and a clear understanding of the modern methods of teaching and evaluating elementary science; and/or

(b) pre-service education of teachers in elementary science, because he has obtained a clearer understanding of the present needs of the elementary school in terms of the professional preparation of prospective teachers for science teaching, for example, the need for future teachers to actually experience the science processes; and/or

(c) in-service education of teachers in elementary science because he has been given sufficient opportunities to study the different types of in-service training activities that have been carried out in different regions and countries, their merits and shortcomings, and other concomitant teacher activities such as the improvisation of science equipment and the development of school science facilities.

IV. REVIEW OF THE COURSE - PRIMARY SCIENCES - TCM-1

A. General Scope

Under the direction of experienced consultants and teachers, the participants will consider the following topics within a frame of reference acquired by first-hand experience through both study and practice with selected examples of modern elementary curriculum materials:-

-The psychological basis for elementary school science
-The process and content of elementary school science
-Curriculum innovation
-Improvisation of science apparatus
-Techniques of curriculum evaluation
-Adaptation and/or modification of curriculum materials
-Implementation of new curricula
-Teacher training techniques.

B. Course: Rationale and form

1. Assumption

a. participants will be educational leaders teacher training specialists and curriculum development specialists from SEAMEO member countries, they would be expected later to play a leading role in the preparation, modification, or adaptation of elementary materials in their respective countries, and in the implementation of the use of such materials.*

b. the course is intended to expose participants to modern elementary science education philosophies methods and content as exemplified in a wide variety of new curriculum materials from various countries and regions.

c. the length of the course should be sufficient to provide ample opportunity for an unhurried study of the issues in question yet not so long as to incur a hardship on the participants or on the member country agencies which must provide released time for each participant.

d. the manner in which the course is presented and conducted should, in all its aspects, be a model of the way that participants will be encouraged to implement national programmes upon their return.

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* RECSAM Note: Several Consultants in subsequent reviews of the Workshop report strongly recommended that at least one highly qualified practicing primary science teacher from each member country be included. This would help insure realistic and practical results during national implementation.

2. Form of the Course*

It is hoped that the Course Director will organise and present the course using, as much as practicable, the techniques and methods that characterise the "new approaches to science education," thus giving the participants practice both in learning and in teaching according to these methods. It was emphasised that the new approaches embody two equally important elements--technique and content. It was suggested that many of the participants may have had little or no experience in learning in situations other than traditional ones, and that the opening phase of the course might, therefore, be presented along these more directed familiar lines. A gradual shift would then be made to a less closely directed approach and individual exploration of problems encouraged, especially in the basic "practical" sector of the course. This sector will be conducted largely in the laboratory, the shop, and the demonstration school. Attention to certain discrete problems, such as The Psychological Bases for Modern Science Education, and Problems of Innovation, probably would need to be dealt with largely through lecture discussions and seminars with emphasis on the encouragement of group discussions and free participation.

Orientation (1-2 weeks)

The purposes of the Orientation Phase will be to help the participants develop:-

1. A general understanding of the need for innovation in elementary - science education;
2. A clear view of the purposes, objectives, and nature of the course;

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* The material in Item 2 "Form of the Course," is essentially a staff adaptation of material under that heading in the working paper entitled "Some Thoughts on the Planning of the Training Course on Modern Methods in Teaching and Evaluating Elementary/Primary Science," which appears as Supporting Professional Document No. 7 by Dr. Salinger. The wording for this topic in the Working Paper was approved by the Workshop.

A chart showing the way in which the various elements of the course could be carried out sequentially and, in some respects, collaboratively with the concurrent course on Elementary School Mathematics (TCM-1) was presented to the Workshop, and was approved. This chart and explanatory notes entitled "A Suggested Plan for Administration for Concurrent Projects TCE-1 and TCM-1" was also approved by the Mathematics Workshop and is included in the report of that Workshop. A copy is included in this report (see pages 19 & 20)

3. A realisation of the responsibility of the individual teacher and of the educational system as a whole in formulation and implementation of policies affecting the intellectual development of human beings; and

4. A recognition of the problems, and of the economic and developmental consequences, in the preparation of citizens who are literate and functional, in the broadest sense of these terms, in this technological age without sacrifice of national and cultural heritage.

Exploratory phase (6-8 weeks)

A cyclical approach to the examination of new materials involving four steps; science laboratory work, teaching laboratory, critique of teaching, and seminar. During this time, the process, content, and methods used in the new materials would be examined. In addition, the rationale for these programs and, indeed, for elementary science education itself, would be considered at this stage in the course, as well as the psychological basis for some newly developed materials. In addition, provision will be made for practical work in the laboratory, shop, and demonstration school for a more complete and directed look at the products of several selected curriculum projects whose materials represent divergent views. Actual practice will be given the participants in preparing adaptations of sample units of work to conform with regional and national requirements and conditions.

Collectively Directed Phase (4-6 weeks)

This will be a concerted period of discussion and study utilising the experience gained in the exploratory phase. Topics for consideration at this time will include the problems of content selection, innovation, evaluation, implementation, and teacher training. Practical work will continue through this phase.

3. Programmes Suggested for Review

Participants should be given a change to study and have first hand experience in working with elementary science materials developed in America, the United Kingdom, the Philippines, Australia, and Africa, such as: African Primary Science Program (EDC), Nuffield Junior Science, Philippines ESCD and ESS, AAAS - Science - A Process Approach, Conceptually Oriented Program for Elementary Sciences (COPES), ESS, Minnemast, SCIS, and selected materials from SSCP and WIMSA.

Participants should have the opportunity for discus ing new curriculum developments with people closely involved with work of some of the major curriculum projects.

4. Special Issues

Beyond the issues which arise from study of new materials, themselves, are those which might be considered basic to any study of elementary science education.

Included might be

The non-equivalence of elementary and post elementary science teaching.

Sequential vs. non-linear learning.

The pros and cons of behavioral objectives.

Materials prepared for teachers (i.e. teachers guides) vs. materials prepared for student use.

The role of reading in elementary science and the provision of auxiliary reading materials, and so on.

5. Special Provisions

To insure that several types of activities are included in the course aside from the regular content, provision should be made for:-

a. Adequate un-committed independent study time.

b. Trial of materials by participants with small groups of children.

c. Examination and discussion of on-going programs being conducted or developed in member countries, and discussion of the planning of coordinated programs where this is feasible.

d. Assistance to the participants in developing guide lines to draw up pilot and/or adaptation schemes to suit their local needs.

e. Testing and/or trial teaching of some of the participants' adaptations, with time for further refinements, if required.

f. Staff pre-planning before course.

g. Regular meetings of staff and participants to review the progress of the course and to make alterations or modifications, if necessary or advisable.

C. Topical Details

1. Learning theories, processes, and content

This phase of the course should give the participants a working knowledge of modern child-learning theories and a deep insight into various curriculum development projects.

a. Modern learning theories as applied to science education.

b. Review of research which has affected modern learning theories.

c. Review of current research on elementary science.

d. Review of the psychological basis for the method and content of new elementary science programs which will be examined.

2. Curriculum innovation, and apparatus improvisation

Consideration of the techniques and major problems associated with curriculum innovation and provision for development, review, and possible evaluation of sample lessons developed by participants. Included will be discussions of:-

a. The philosophical basis for content selection and style of approach.

b. The techniques for the preparation of written materials for teachers and/or students.

c. The development of auxiliary materials, such as apparatus and visual or audio aids.

d. The implementation of curriculum and the changes required, including necessity for appropriately trained teachers familiar with the philosophy and approach of the new materials.

e. The problem presented by the opposition to change generally offered by traditionally oriented teachers.

f. The fact that to be successful, innovation requires the sympathy and support of administrators, legislators, and the public.

3. Techniques of curriculum evaluation

Consideration of the development, revision and implementation of evaluation schemes, with provision for participants to prepare critiques, tests, and to revise various types of evaluation instruments.

a. The problems of evaluation in curriculum development.

b. Techniques of student evaluation and testing for:

Content

Skill

Attitude

c. Problems that may arise in implementation of evaluation techniques

1) application of inadequate techniques

2) wrong application of good techniques

3) interpretation or mis-interpretion of data

4) restrictions imposed by local and national educational authorities

d. Review of techniques used in various new elementary science programs, including a study of the statistics necessary to properly interpret their results.

e. Methods of evaluating the effectiveness of teachers in presenting new science programs.

4. Adaptation and/or Modification of Curriculum Materials

Accepting as a working principle that whether materials are selected from new programs in whole or in part, their relevance to the science curriculum of the participant countries should be the primary consideration governing adaptation and/or modifications, the participants will, among other issues, consider:-

a. The rationale for making adaptations

b. The emphasis that should be given in adaptation to contributions and relationships to contemporary life in the participant countries.

c. The problem of adapting material so that it relates to the environment of the country so that pupils will appreciate the potential of science and scientific thought to social and economic progress in the country.

d. The problem of preparing materials that encourage acceptance of the idea that the proper study of nature is nature itself.

e. The preparation of materials to encourage curiosity, experimentation, and the development of scientific concepts, relevant content, and skills.

f. The question of copyright law with respect to adaptation and/or modification of protected materials.

The course should give the participants practical experience in the preparation, trial, evaluation, and revision of adapted materials.

5. Implementation and Teacher Training

This aspect of the course will be devoted to the problems of implementation of new curricula and the associated problems of pre and in-service teacher training.

Implementation problems which will be considered are:-

a. Establishment of a receptive climate for the introduction of curricular change at the national and sub-national levels.

b. Consideration of the rate at which curricular change can or should be introduced.

c. The problems of pre- and in-service teacher education and the differences between the two.

Teachers-training issues which will be considered are:-

a. Evaluation of pre- and in-service training in elementary science teaching that has been carried on in the participating countries.

b. Formulation of statements of what is desired in today's elementary science program in terms of professional training of teachers.

c. Study and critique of available reports on successes and failures of in-service training activities in the different countries at the national, regional, school district, and individual school level.

d. Formulation of practical plans for pre- and in-service training that may be used in the participant countries (individual participant's responsibility).

All of the above experiences should be primarily directed toward finding solutions to the recognised problems of pre- and in-service training of elementary science teachers, such as:-

a. Inadequate content background in science.

b. Lack of familiarity with modern teaching methods.

c. Financial difficulties of teachers which prevents them from obtaining further training.

d. Difficulties facing teachers who try to study and teach at the same time.

e. Lack of adequate materials and equipment.

f. Inability to improvise equipment and materials.

g. Inadequate knowledge of laboratory techniques.

h. Inadequacy of the in-service training opportunities afforded to teachers.

i. Non-availability of curriculum materials that reflect the more productive approaches to science teaching.

D. Suggested Duration of Course and Number of Participants

1. Time Duration

The group accepted the maximum duration of 4 months as the working basis for financial consideration and staffing of the Primary Science Course. A target starting date of May 1970 was agreed to.

2. Participants

It is suggested that a highly competent curriculum planner at Ministry of Education level from each country who is involved in Primary Science programme revision, and two teacher-educators responsible for the pre-service training and in-service training of teachers attend this course as listed below;*

a. at RECSAM expense

Country	Curriculum Planner	Teacher Educators	Total
Indonesia	1	2	3
Malaysia	1	2	3
Philippines	1	2	3
Singapore	1	2	3
Thailand	1	2	3
Vietnam	1	2	3
	6	12	18

b. Possible participation at US/AID expense

Laos	1
Nepal	2
	3 Total

3. Financial Considerations (Subject to further review at next coordinating meeting)

(i) for RECSAM participants:

Air travel - 18 x $160	$2880	
Stipend for 18 weeks - $25/week x 18	8100	$10,980

(ii) Staffing

6 part time staff experience in conducting Primary Science programmes using local materials.

Travel - 6 x $160	960	
Per diem - 16 days - $16/day x 6	1536	
Honoraria at $150 x 6	900	3,396

(iii) Other operational expenses

Purchase of developed materials	2000	
Purchase of books & supplies	1000	
Local transportation	300	
Support Services Laboratory Assistant	300	
Miscellaneous	500	4,100

(iv) Contingencies 704

Total $18,680

4. Staffing

a. The group recommends the immediate appointment of the Course Director who would be responsible for the organisation and conduct of the course under the guidance of the Head of the Training Division.

b. The following full time staff has been budgetted by RECSAM.

(i)	Director of RECSAM	starting	1st Jan. 1970
(ii)	Head of Training Div.	"	1st Jan. 1970
(iii)	Training Consultant through US/AID	"	1st July 1969
(iv)	Primary Science Consultant through UK/CREDO	"	1st Sept. 1969
(v)	Training Officer	"	1st July 1969
(vi)	Information Officer	"	1st July 1969
(vii)	Information Consultant US/AID	"	1st July 1969

The Programme Coordinator is only available up to 31st December 1969 to co-ordinate the activities of RECSAM.

c. It is suggested that additional consultants who are available from US, UK, or Australia through assistance programmes and who are involved with the conduct of Summer Institute, etc., at the expense of US/AID, UK/CREDO, etc., be invited.

d. It is strongly recommended that locally available part time staff from the region who had had experience in conducting and evaluating Primary Science materials in their own countries be invited to assist in the course for a short duration of two weeks at staggered intervals according to needs.

e. It is recommended that the Primary Mathematics Course be conducted simultaneously and that the experts on learning theories on both science and mathematics and possibly other experts should be fully utilized according to the needs of both courses. Where needs are common, the two groups can join sessions.

E. Recommendations of the Primary Science Planning Workshop

1. The Course Director should be appointed as soon as possible.

2. Planning of the course should be started immediately so that it could begin early April 1970.

3. The director of the course should immediately perform the following in cooperation with the Head of the Training Division.

   (i) Selection of staff to help conduct the course.

   (ii) Collection and purchase of all materials needed for the course.

   (iii) Arrangements for the use of facilities for the conduct of the course with the assistance of the RECSAM Training Officer.

4. RECSAM should negotiate with the Ministry of Education, Malaysia, for a pilot school near the Centre for observation and the try-out and demonstration of curriculum materials.

5. All available information relative to the course should be sent as soon as possible to the National Coordinating Committees of the participant countries so that the selection and preparation of the training participants can be started.

SUPPORTING PROFESSIONAL DOCUMENTS

SUPPORTING PROFESSIONAL DOCUMENTS

		Page No.
1	Primary Science Planning Workshop - Background Material - Primary Science - A Process Approach.	17
2	Abstract of other relevant planned RECSAM Projects.	18 - 25
3	Working Paper No. 1 - Modern Methods in Teaching & Evaluating Elementary Science.	26
4	Working Paper No. 2 - Suggested Framework For Planning Course	27
5	Working Paper No. 3 - A Six Month Course In Elementary Science	28 - 31
6	Discussion Paper No. 1 - A Model For A Comprehensive In-Service Training Programme For Science Curriculum Innovation - by Charles M. Weller.	32 - 29
7	Discussion Paper No. 2 - Some Thoughts On The Planning Of The Training Course On Modern Methods In Teaching And Evaluating Elementary/Primary Science - by Dr. R. Salinger.	40 - 42
8	Discussion Paper No. 3 - by Mr. Hee Hoi Choo, Malaysia.	43 - 44
9	Discussion Paper No. 4 - A Suggested Plan For Administration Of Concurrent Projects - by Mr. H.F. Foncannon.	45 - 47
10	Discussion Paper No. 5 - Guide In The Preparation Of Elementary School Science Materials - by Prof. P.P. Jesuitas.	48 - 57

SUPPORTING PROFESSIONAL DOCUMENTS - 1

- BACKGROUND MATERIAL

The SEAMEC Regional Centre for Education in Science and Mathematics, Penang, Malaysia with the kind cooperation of the Republic of the Philippines is organising this workshop as agreed upon at the Fifth Meeting of the Steering Committee held at Tokyo from 31st March to 7th April, 1969.

An extract ofthe minutes 14.3 - Primary Science, A Process Approach July, 1970, follows

14.3 Primary Science - A Process Approach - July 1970

The meeting resolved that a workshop to discuss a new science programme for elementary school (Science - A Process Approach) suggested by Dr. Foncannon see page 45 should be held some time in July 1970 to coincide with the ending of RECSAM Course TCE-1. It was also decided that the participants of this workshop should consist of TCE-1 participants and visiting consultant experts. It was suggested that, if possible, the Workshop be tied into the planned curricula research programme. In particular, members of the Research team for RCE-1 (Curriculum Development - Elementary Science Materials) could be selected early enough to attend this workshop, which would then serve as the "kick-off" for the one year research project.

14.3 Planning Session for RECSAM Course TCE-1 incorporating the Workshop on "Science - A Process Approach"
Mr. A. Juele of the Philippines was elected Chairman of this planning session and it was decided that the session should be held in late June this year in the Philippines. The one representative from each country to be nominated to attend this meeting should be a person who has knowledge of, or who has examined the new Elementary Science Curriculum materials such as AAAS - Process Approach, KSS materials, Minnemast and others, and/or one who has responsibility for supervision of, or teacher training for, elementary science teachers.

SUPPORTING PROFESSIONAL DOCUMENTS - 2

ABSTRACTS OF RELEVANT PROJECTS

The following five abstracts describe the Elementary Science Course TCE-1 and four additional related RECSAM projects that were necessary to review and integrate where feasible during the Workshop. As noted earlier these abstracts are taken verbatim from the Centre Development Plan Part I. The proposals from which the abstracts were made (see Item II of the abstract) are contained in full detail in Part II of the Plan.

SUPPORTING PROFESSIONAL DOCUMENTS - 2

ABSTRACTS OF RELEVANT PROJECTS

I. CODE AND TITLE:

TCE-1 Modern Methods in Teaching and Evaluating Elementary Science.

II. DEVELOPED ON THE BASIS OF PROPOSALS:

E1-2, ET-3*

III. OBJECTIVES AND BENEFITS:

This course will train leaders and teacher-training specialists in elementary education for each country participating who can play primary roles in introducing modern elementary education methods and appropriate content to their countries and help prepare teachers to implement the new curricula and methods.

IV. DESCRIPTION:

Under the direction of experienced consultant-teachers, the participants will examine the work done in improving elementary science education in more highly developed countries, study appropriate means of adapting published work or developing new materials to the needs of the countries of the region, study and practice modern teaching methods in elementary science, and study along with modern child-learning theory, appropriate means of evaluating the effectiveness of instruction according to the goals sought.

V. PARTICIPANTS:

Four to six teacher-training lecturers of leaders in elementary education from each country, who, on returning home, can help direct the adaptation of new curricula and help train or retrain the teachers needed to implement new curricula.

VI. DURATION AND PHASING:

A six-month course, to be repeated annually so long as regional demand exists. Cycles after the first may need modification in length or content according to experience.

A month of preparation time should precede the course, and an evaluation period follow it. If the course is offered concurrently with other TC-courses, especially TCM-1, there will be opportunity to co-operate and communicate many proolems of mutual interest.

NOTE: Proposed for January to June, 1970.

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*These codes refer to the basic project proposal described in detail in Part II of RECSAM Development Plan (P5/SCMS/14).

SUPPORTING PROFESSIONAL DOCUMENTS - 2 (cont'd)

PROJECT PROPOSAL ABSTRACT

I. CODE AND TITLE:

TCM-1 Modern Mathematics Teaching and Evaluation for Primary Schools.

II. DEVELOPED ON THE BASIS OF PROPOSAL:

MT-1

III. OBJECTIVES AND BENEFITS:

A course designed to train for each of the member countries to cadre of persons qualified in modern primary-school mathematics methods and content who can serve as leaders in the introduction of new curricula to their countries' schools.

IV. DESCRIPTION:

Under the guidance of one or two consultant-teachers, the participants will analyse existing modern primary mathematics programs, discuss and evaluate the long term content needs of the region, including timing of introduction of new elements, study and practice modern teaching methods, and study and practice appropriate evaluation mechanisms.

V. PARTICIPANTS:

Four to six lecturers in elementary mathematics or other leaders in elementary mathematics programmes from each country, who will be in positions to play leading roles in the development and implementation of modern mathematics curricula for the primary schools of their countries.

VI. DURATION AND PHASING:

A six-month course, offered annually as needed by the region, with modification of later cycles as required by experience.

A month of pre-course preparation and a period of post-course evaluation is needed. If possible some co-ordination with course TCE-1 would benefit both groups. It would also be preferable to have participants in TCM-1 and TCM-2 together for at least two weeks in order to give them an indication of the articulation of between Primary and Secondary Mathematics.

NOTE: Proposed for January to June, 1970.

SUPPORTING PROFESSIONAL DOCUMENTS - 2 (cont'd)

PROJECT PROPOSAL ABSTRACT

I. CODE AND TITLE:

RCE-1 Curriculum Research and Development of Materials for Elementary Science.

II. DEVELOPED ON THE BASIS OF PROPOSALS:

ER-1, ES-1

III. OBJECTIVES AND BENEFITS:

This project will devote itself to research in concept development and learning in Asian children, the design of learning situations in elementary science to utilize this knowledge, and the design of learning materials to carry it out, which can be tested and used in the region.

IV. DESCRIPTION:

The research team will study current published materials in modern teaching methods in elementary science and psychological literature on concept development and learning in children, will design studies to test these concepts in Asian children, and will adapt or design teaching materials to utilize this knowledge in increasing the effectiveness of science teaching in the region. Prototype teaching materials such as guides and kits will be prepared for duplication and testing in member countries. Feedback will be used to improve designs.

V. PARTICIPANTS:

One member from each participating country, a senior educator with experience in elementary school teaching of science and qualifications in educational psychology, child development, etc. At least part time consultants from outside will be required.

VI. DURATION AND PHASING:

Six months the first year, and additional period of three months each in subsequent years; local testing and work will be carried out in the interim periods. Co-ordinate with TCE-1 and RCM-1.

NOTE: Proposed for July to September, 1970.

SUPPORTING PROFESSIONAL DOCUMENTS - 2 (cont'd)

FUNCTIONAL DIVISION: TRAINING

(a) CODE DESIGNATION AND NUMBER:

EST-2

(b) TITLE:

Modern Trends in the Teaching of Elementary Science

(c) AIMS AND OBJECTIVES:

To train key Elementary Science personnel from the six member countries. The course includes lecturers, workshop sessions, improvisation of apparatus, preservation of biological specimens, teaching practice and seminars. The importance of the course is to acquaint participants with the modern philosophy and methods in the teaching and evaluation of Elementary Science particularly as it relates to each individual country.

(d) DESCRIPTION OF COURSE:

A comparative study of the philosophy, content, approaches and methods in the teaching of Elementary Science and the formation of concepts and the learning process of children relating particularly to children of 6 - 12 years of age.

(e) DETAILS OF COURSE:

(i) CONTENT

To be based on the latest tested project materials published in advanced countries and on the latest trends in the teaching of Elementary Science and the needs and facilities in each individual country. Pilot schools are required at national level. For methods course refer to (c) above.

(ii) DURATION

3 months course

(iii) SPECIAL COSTS

US$24,000/- over 5 years.

(iv) PHASING

2 courses a year starting from the 2nd Year depending on the need and the availability of participants.

(v) BENEFITS

See EST-1

SUPPORTING PROFESSIONAL DOCUMENTS - 2 (cont'd)

(f) SPECIAL INSTRUCTION/COURSE MATERIALS AND EQUIPMENT NEEDED:

(i) INSTRUCTIONAL/COURSE MATERIALS

See EST-1

(ii) EQUIPMENT

See EST-1

(g) PARTICIPANTS:

(i) QUALIFICATIONS

Members of RESC, top administrators and educators. Educators e.g. organisers, supervisors, advisors and teacher trainers.

(ii) NUMBER

24 a course

(h) PROFESSIONAL STAFF:

See introduction
It is assumed that 2 experts will be available for every course in each year.

(i) SUPPORTING SERVICES AND CO-ORDINATION WITH OTHER FUNCTIONAL DIVISION

(i) SUPPORTING SERVICES

(a) Administration
Typing See EST-1

(b) Technical or
Laboratory Personnel See EST-1

(ii) CO-ORDINATION

See EST-1

(j) PLAN FOR EVALUATION:

General coordination from total evaluation programme.

SUPPORTING PROFESSIONAL DOCUMENTS - 2 (cont'd)

FUNCTIONAL DIVISION: TRAINING

(a) CODE DESIGNATION AND NUMBER

EST-3

(b) TITLE:

Evaluation and Measurement in Elementary Science.

(c) AIMS AND OBJECTIVES:

1. To assist member countries develop evaluation techniques pertinent to new development in Elementary Science teaching.

2. To assist member countries plan a national procedure for the evaluation of Elementary Science at different levels.

(d) DESCRIPTION OF COURSE:

A class of two participants from each member country will form a group under experts in Elementary Science evaluation and measurement.

(e) DETAILS OF COURSE:

(i) CONTENT

1. Evaluation and measurement in terms of behavioural objectives in Elementary Science.

2. Purposes, philosophy and educational measurement.

3. Validity and reliability of evaluative devices.

4. Study and examin ation of newer types of evaluation devices and tests.

5. Practice in developing classroom tests items and other competency measures.

(ii) DURATION

3 months

(iii) SPECIAL COSTS

(iv) PHASING

One in the 1st, 3rd and 5th years.

(v) BENEFITS

1. Participants will be able to conduct courses on evaluation and measurement in their own countries.

2. To plan evaluation programmes at the National level.

SUPPORTING PROFESSIONAL DOCUMENTS - 2 (cont'd)

(f) SPECIAL INSTRUCTIONAL/COURSE MATERIALS AND EQUIPMENT NEEDED:

(i) INSTRUCTIONAL/COURSE MATERIALS

1. Sample tests from the curriculum studies.
2. Latest books on evaluation and measurements.
3. Sample tests from member countries.
4. Reference books on the subjects.

(ii) EQUIPMENT

Nil.

(g) PARTICIPANTS:

(i) QUALIFICATIONS

Experts in evaluation at National Level.

(ii) NUMBER

1 - 2 from each country

(h) PROFESSIONAL STAFF:

We assume 2 experts for every course.

(i) SUPPORTING SERVICES AND CO-ORDINATION WITH OTHER FUNCTIONAL DIVISION:

(i) SUPPORTING SERVICES

a) Administrative Staff
As in EST-1

b) Technical or Laboratory Personnel

(ii) CO-ORDINATION

Techniques of evaluation and measurement in elementary science should be co-ordinated with techniques in the lower secondary classes.

(j) PLAN FOR EVALUATION:

Feedback and seminars
In the 3rd and 5th years members of the group who will come back, the Centre will report on National Education Programme.

SUPPORTING PROFESSIONAL DOCUMENTS - 3

WORKING PAPER NO. 1
MODERN METHODS IN TEACHING AND EVALUATING ELEMENTARY SCIENCE

Scope: It is envisioned that the course include the following four major areas:

1. Psychology of learning science and/or mathematics - 4 weeks.

2. Content (concepts) of elementary science - 6 weeks. (Plus 1 more week micro-teaching).

3. Methods of teaching elementary science - 6 weeks. (Plus 1 more week micro-teaching).

4. Evaluation of learning in elementary science - 6 weeks.

Nature: The approach in conducting the course is by team teaching as described below:

1. A psychologist to handle the first part of the course reflecting the ideas of Piaget and Gagne and constructing behavioral objectives.

2. Two experts, science educators, to handle both content and methods either one doing content and the other methods or both cooperating in doing content and methods simultaneously. This should include observation of classes taught by demonstration teachers.

   The last two weeks to be used for micro-teaching, to be assisted by possibly another expert.

   The workshop by Dr. Foncannon on Process Approach can be a part of this period.

3. One expert on evaluation techniques in science and mathematics, to correlate with objectives and to teach techniques, and skills in developing evaluative instrument.

4. One expert science educator in elementary science to coordinate the course as well as to teach either content or methods.

SUPPORTING PROFLSSIONAL DOCUMENTS - 4

- IORKING PAPER NO. 2
SUGGESTED FRAMEWORK FOR PLANNING COURSE

Area	Weeks	Topics	Activities	Materials
Psychology	1st week 2nd week 3rd week 4th week			
Processes		Observing Describing Comparing Classifying Inferring Measuring Graphing Formulating hypothesis and models Predicting Controlling variables Experimenting		
Content		Living Things Matter Energy Force and Motion Earth Space		
Evaluation				

SUPPORTING PROFESSIONAL DOCUMENTS - 5

WORKING PAPER NO. 3
A SIX-MONTH COURSE IN ELEMENTARY SCIENCE

Period	Topics	Activities	Materials
1st week	A. Psychology Psychology of learning among children of various ages Studies of Piaget and Gagne and other appropriate reviewa of teaching/learning theory	Lecture discussion Examination of studies	
2nd week	Psychology of teaching in science and mathematics		
3rd week	Concept development especially in science and mathematics		
4th week	Behavioral objectives	Study of statement of objectives Exercise in framing objectives	Hand-outs E S curriculum guides
5th week	B. Methods 1. The Process Approach 2. New ESS materials on Process Approach	1. Pre-test 2. Lecture discussion 3. Examination of current materials	Hand-outs ES materials SEC, AAAS, etc.
6th week	1. Observation, description, comparison	1. Process experiences (laboratory) 2. Lecture discussion 3. Construction work	Selected exercises Shop tools

SUPPORTING PROFESSIONAL DOCUMENTS - 5 (cont'd)

Period	Topics	Activities	Materials
7th week	1. Classification 2. Inference 3. Teaching devices	1. Process experiences (Laboratory) 2. Examination of Materials, lecture discussion 3. Construction work	Work sheets Shop tools
8th week	1. Formulating Hypothesis and models 2. Teaching devices	1. Process experience, examination of curriculum materials 2. Improvisation of materials	Work sheets Shop tools
9th week	1. Measurement 2. Graphing 3. Prediction 4. Teaching devices	1. Process experiences (Laboratory) 2. Examination of curriculum materials 3. Improvisation	Work sheets Shop tools
10th week	1. Experimentation 2. Teaching devices	1. Process experiences (Laboratory), examination of materials 2. Improvisation	Work sheets
11th week	C. Content 1. Concepts: Living things (Plants) Lower primary	1. Examination of curriculum materials, discussion of sequence performing selected activities construction work Lecture demonstration	ES materials Kits Shop tools
12th week	1. Concepts: Living things (Plants) Upper primary Rice plants, food production	1. Examination of curriculum materials, discussion of sequence performing selected activities corstruction work Lecture demonstration	Development of appropriate Instructional Techniques and materials

SUPPORTING PROFESSIONAL DOCUMENTS - 5 (cont'd) P5/SCMS/17

Period	Topics	Activities	Materials
13th week	1. Concepts: Living things (Animals)	Examination of curriculum materials, discussion of sequence performing selected activities construction work Lecture demonstration	
14th week	1. Concept: Matter	1. Examination of materials 2. Discussion of sequence 3. Lecture demonstration 4. Laboratory exercises	
15th week	1. Energy and motion		
16th week	1. Earth and space		
17th week	1. Additional topics		
18th week	E. Evaluation 1. Objectives and Evaluation	1. Study of objectives & evaluation procedures. (Evaluation Plans should be made before course begins)	
19th week	1. Evaluation Instrument	1. Constructing instruments	
20th week	1. Evaluation techniques		
21st week	1. Materials of instruction	1. Exam. of materials 2. Ordering materials 3. Construction of " (These should be developed concurrently with content not separately)	

Period	Topics	Activities	Materials
22nd week	1. Materials of Instruction		
24rd week	1. Micro-teaching		
25th week	1. Teacher-Training Techniques		

SUPPORTING PROFESSIONAL DOCUMENTS - 6

DISCUSSION PAPER NO. 1

A MODEL FOR A COMPREHENSIVE IN-SERVICE TRAINING PROGRAMME FOR SCIENCE CURRICULUM INNOVATION*

by Charles M. Weller

Assistant Professor of Science Education, University of Illionis, Urbana

In an age characterized by great scientific and technological advances, it is ironic and somewhat distressing that the quality of education in the science has not improved more rapidly than it has. Present day practices do not seem to be accomplishing the fundamental purpose of education: to prepare individuals to meet the pressing demands of complex culture. Unfortunately, children receive some of the poorest instruction in science during their early years in school--a crucial stage in their development.

Under these circumstances, it is imperative that elementary school administrators and teachers undertake critical analyses of what they have been and are doing in science education and of what the results of these practices have been. Next they must reflect upon what should be done and attempt to bridge the gap between that which exists and that which is desired.

There are several questions which should be considered when making such an appraisal: Why should children study science in elementary school? What kind of knowledge in science should children have? What should they know about the nature of or status of this knowledge? What should they be able to do with this knowledge? How would science be presented to children?

Unfortunately, very few elementary teachers are able to give an immediate and meaningful response to any of these questions. In fact, many teachers quickly admit that they know little or nothing about science and, indeed, are frightened by the prospect of teaching it--at least teaching it in the way suggested by some of the recent curriculum developers. This is not a reflection upon the capabilities of teachers; it is simply another example of the adequate training in science and science education that most teachers have received. If teachers are to undertake meaningful appraisals of their science teaching, these appraisals must occur in a programme in which the participants develop a basis for making them.

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*Prepared for publication in Illinois Journal of Education, (January), 1967.

SUPPORTING PROFESSIONAL DOCUMENTS - 6 (cont'd)

On the brighter side, largely because of the efforts of course content improvement projects, some help is now available to teachers and administrators. Science curriculum projects are innovating new content materials and new approaches to the teaching of science at all levels including the elementary school. Examples of these projects are: the Elementary Science Study (ESS), a branch of Educational Services Incorporated (ESI); Science - A Process Approach being developed by the American Association for the Advancement of Science (AAAS); the Science Curriculum Improvement Study (SCIS) at the Berkeley campus of the University of California; and, the Elementary-School Science Project (ESSP) and the School Science Curriculum Project (SSCP) located at the University of Illinois.

However, the existence of curriculum projects has not yet resulted in significant change in most elementary school classrooms. Though improved teaching materials are becoming increasingly available, they are being used in relatively few schools. A variety of factors contribute to this limitation:

1. many teachers are simply unaware of the existence and/or value of these materials;

2. the projects are still in early stages of development and, in general, have produced only short independent units or fragments of planned comprehensive programmes which, as envisioned by many teachers and administrators, do not fit conveniently into the present science programmes

and 3. the marketing of materials has been slow, leaving many potential users frustrated in their attempts to purchase these new materials.

One expects that in due time each of these obstacles to adoption will be eliminated, opening the paths to wide acceptance of new science programmes.

There is another obstacle to improvement in elementary school science teaching which is of greater concern to the writer than the problem of adoption of new materials. In many classrooms where the new materials have been adopted, the materials are often used in a manner inconsistent with the intent of much of the innovation.

That is, the material is not taught in a manner that is condusive to the development of a conceptual framework which the child can efficiently and effectively perceive and operate in the physical and biological world.

Of the two problems which must be resolved,

1. the adoption of new science curriculum materials

and 2. the proper presentation of these materials, the latter is certainly the most crucial and difficult to solve.

It requires a bold approach, capitalizing on all available resources of talent and materials. Nathanial H. Frank, Director of the Co-operative Programme in Teacher Education sponsored by Educational Services Incorporated, has stated:

> We now find ourselves in the situation where there is real danger that the very large investment, both in money and in talent, in generating first-class course content improvement projects, will be largely wasted unless adequate numbers of teachers are educated to teach effectively both the currently developed new materials and those that will emerge in the future. The task of satisfying this critical need for highly competent teachers is almost overwhelming. The present number of pupils in elementary schools (through grade 8) is about 35,000,000; the number in secondary schools about 13,000,000; and the total corps of teachers for these students approximates 1,900,000.*

Why should any special form of teacher education be necessary in this instance? Should not an experienced teacher be capable of taking new curriculum materials and using them effectively in the classroom? On this basis of subjective evidence that has been widely reported, it appears not. On reflection it seems that the character of the new curriculum materials requires such a fundamental change in the way teaching is conducted that most teachers cannot reasonably be expected to understand these approaches without substantial help.

> Although the course content improvement projects centre on improvement in curriculum, in the "what" of learning, another aspect of the question soon appeared. Some attention must be paid to the "how" of learning, to the performance

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*Frank, Nathanial H., "The Cooperative Programme in Teacher Education", ESI QUARTERLY REPORT, Summer-Fall 1965, p. 156, Educational Services, Inc. Watertown.

SUPPORTING PROFESSIONAL DOCUMENTS - 6 (cont'd)

> of the teacher in the classroom and laboratory. The teacher education issue has now been raised in such a way that it can no longer be ignored. For the new curricula, on which large amounts of human and material resources have been spent, will never be completely effective until all the classrooms are staffed with fully competent instructors. The goals of the new courses, however noble, and the materials for teaching and learning, however carefully structured, will never be fully implemented until the vast number of our teachers understand something of the philosophy that has been so carefully woven into the fabric of the new curricula.*

Teachers are now being asked to accept a wholly different set of values with respect to teaching itself, including what is important and appropriate to teach and how such knowledge can be successfully cultured. The teacher must not only accept but also understand the underlying philosophy of a given set of materials and must, in an effective manner, be able to translate that philosophy into concrete classroom activities. The dubious as well as enthusiastic teacher must be acquainted with the curriculum's philosophy and its relevance to his particular classroom situation. This can only be accomplished by a comprehensive training programme.

Many colleges and universities are presently engaged in researching and developing such programmes for both pre-service and in-service teachers. However, total responsibility for such an undertaking cannot be left to the colleges and universities. Local school systems, too, have an obligation to prepare teachers for innovation. Indeed, in-service programmes can be made most effective when they are conducted within a school system. In this context, programmes can be adapted to fit the needs peculiar to the specific system and hence become much more relevant for the participating teachers.

The model suggested here for a comprehensive in-service programme includes four different but interrelated elements: a science laboratory, a teaching laboratory, teaching laboratory critiques, and a seminar. Each of these elements has been employed by the writer or his associates at the University of Illinois in training programmes involving both prospective and experienced teachers. As a consequence of these efforts the writer feels that each of these elements, or some modified version of each, is essential to any programme which hopes to train teachers in the proper use of new science curriculum materials.

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*Marshall, J. Stanley, "Improving Teacher Education," ESI QUARTERLY REPORT, Summer-Fall 1965, p. 183, Educational Services, Inc., Watertown.

SUPPORTING PROFESSIONAL DOCUMENTS - 6 (cont'd)

It is almost a sine qua non that a teacher must acquire some insight into the nature of science if he is to develop an understanding of the philosophies underlying the curriculum development projects. As stated earlier, the traditional science courses, from elementary school through college, have been ineffectual in providing this insight. It is not uncommon for even the student majoring in science to lack this insight until he has become involved in his own research in graduate school or on the job. However, this is not an inevitable state of affairs but seems to accrue from a mode of science teaching which has been predominantly verbal, often dogmatic, has dealt in absolutes and, in short, has been a contradiction to the whole spirit of scientific inquiry.

One way to develop this insight is to get a person directly involved in an extended exploration of some specific science topic. The science laboratory provides each teacher with such an opportunity. This would include observation of natural phenomena, generation of theories explaining these phenomena, prediction of additional related phenomena, and the development of experiments to test these theories. The exploration should be at a level of sophistication commensurate with the investigator's science background. Some of the materials developed by the elementary science curriculum projects seem to be at the proper level for most non-science majors and can be easily adapted for this purpose. The writer has used Kitchen Physics and Gases and "Airs" (units developed by ESS) in pre-service training programmes and was quite satisfied with the way they were received.

A note of caution should be raised here. To be successful, this investigation must capture the interest of the investigator - indeed he should even become excited at times over various aspects of his investigation. At any rate, when the interest of the investigator lags, the value of the investigation is questionable. It would be too much to expect that every teacher would be interested in exploring with a given set of materials simply because he had been asked to conduct an investigation using those materials. Therefore, the person conducting the science laboratory must be skillful in generating interest in this aspect of the programme and he must be flexible enough to let teachers investigate other topics which may be more interesting to them. Perhaps the opportunity to investigate a topic which a teacher is presently teaching or will soon be teaching would provide the type of interest sought here.

The exploration or investigation of a particular topic should be continued for several weeks or even months. It is only after the investigator becomes quite familiar with a set of related phenomena that he begins to understand the processes and characteristics of scientific inquiry and the role it plays in the generation of scientific knowledge. In this phase of the programme the teacher should encounter many of the experiences that the curriculum innovators would like children to have.

SUPPORTING PROFESSIONAL DOCUMENTS - 6 (cont'd)

The teaching laboratory provides teachers with an opportunity to try out new curriculum approaches in an atmosphere that is conducive to pedagogical experimentation. It also provides them with a set of experiences, involving the interaction of teachers, new materials, and children, which can be drawn upon in the critique sessions and seminars.

One arrangement for such a teaching laboratory consists of a team of three or four teachers, a group of three or four children, and an observer. The teachers, as a team, plan the strategy for teaching a unit based on a set of new materials. The teachers in the team take turns teaching twenty-minute to half-hour segments of each session. For example, if there are three teachers in a team, each teacher could teach twenty-minute segments of a one-hour session. If there are four teachers, two could teach half-hour segments the first session, the other two could teach half-hour segments the next session, and so on.

Since each teacher is involved to some extent in planning and evaluating each session, there is less chance that any one teacher will feel completely responsible when a lesson goes "sour," as some inevitably will when new approaches are tried. Under these circumstances, if "failures" are met with an open mind they can be as informative as "successes" because they suggest modifications in approach. For this reason, flexibility should be maintained for the duration of the unit, which may continue for several weeks. No strategy should become so sacred that it cannot be changed; no time schedule so rigid that what is planned for one segment cannot be extended to the next segment or even to the next session.

The number of children used in this laboratory should be limited to three or four. This allows the teachers to concentrate on just a few children, to observe closely how these children respond to a certain approach, and to analyse carefully how children develop understanding in science. As the teachers become more familiar with the materials and approaches used, the number of children in the lab sessions may be increased.

Immediately following the teaching laboratory sessions, the team of teachers and the observer participate in a critique session. Here the lesson is analyzed and specific incidents are related to the curriculum's philosophy. Audio and/or video tape recordings of the lab sessions could be used during these sessions to recall specific incidents. Such recordings, however, are not an essential element of the training programme as it is presently conceived.

Both the teaching laboratory and the critiques must be carried on in an atmosphere which is conducive to experimentation and free discussion. This means that a good rapport must exist among all the persons involved. A competent observer who is respected by the teacher is essential. He must be familiar with the new materials and be capable of translating the underlying purposes of these materials into classroom practice. His role, however, is not to tell the teachers how they should

SUPPORTING PROFESSIONAL DOCUMENTS - 6 (cont'd)

teach the lessons, though he can offer suggestions if he is asked for them. His important role is to generate thoughtful discussion among the teachers by raising questions about what they are doing in the teaching labs and about the children's reactions to these practices. In the process of conducting these discussions he must draw attention to specific behaviours of the children and relate these behaviours to curriculum objectives.

All of the various aspects of this programme are linked together in the seminar. Here, the teachers in all the teams meet and discuss their science laboratory and teaching laboratory experiences, inducing from them appropriate and relevant generalisations about the nature of science and about the ways in which children develop understandings in science. Relevant outside readings dealing with the nature of science and educational psychology may also serve as topics for discussion.

The generalisation arrived at in these discussions obviously have implications for teaching science to children. Therefore, care must be taken to relate the generalisations to concrete incidents, so that - ultimately - the teachers will be able to translate them back into specific activities and behaviour.

The various curriculum approaches suggested by different curriculum projects should be appraised in the light of these generalisation and implications. Obviously, the moderator of the seminar must understand the philosophies of the new projects and be capable of relating them to specific classroom situations.

While the proposed programme was developed in a university setting and geared predominantly toward pre-service training, there is no reason to believe that it should be effective only under those conditions. In fact, a few experienced teachers were enrolled in the course in which the elements of the programme were being investigated and they seemed to respond in much the same way as did pre-service teachers. It is the writers opinion that a similar program would be just as effective if conducted for experienced teachers within a school system.

It is to be expected that the actual operation of such a programme would vary among school systems. There are some operating procedures, however, which the writer feels would increase the effectiveness of the programme.

During the first year of operation, only a small group of highly motivated teachers who are receptive to new ideas should be enlisted as participants. If these first teachers are wisely selected and the programme is conducted effectively, the school system should have a cadre of teachers who can be used as laboratory observers or even seminar moderators in subsequent years. A group of three to eight teachers would provide at least one but no more than two planning-teaching teams.

This organisation would also allow one person to conduct the entire program - laboratories, critiques, and seminar. Since many school systems must reach outside their systems to obtain personnel qualified to conduct the programme in its initial year, this may be an important consideration.

If a junior high school or senior high school science lab is available, this would provide an ideal location in which to conduct the science laboratory aspect of the programme. If such a lab is not available, then large tables should be obtained to provide the teachers with a large work space on which they can conduct their investigations. Nearby access to a sink and running water would also be desirable.

Each participating teacher should devote four to five hours a week, for at least a semester and preferably for a year, to the programme. It is the writer's opinion that a substantial proportion of the time alloted to the seminars and laboratories be scheduled during the school day. Afternoons would probably offer the greatest flexibility. Arrangements should be made to release the participating teachers from other responsibilities during this time. Not only does this avoid the obvious problems associated with evening and Saturday sessions (e.g., other commitments, mental and physical fatigue, difficulty in obtaining children, etc.) but it also gives teachers the impression that administrative personnel in the school system think that the programme is important enough to make it a part of their job.

The designers of a programme directed toward curriculum innovation must take this last suggestion into serious consideration. Such an in-service training endeavour necessitates administrative, professional and social recognition and support of any curriculum innovation and the philisophy on which it is based. Key administrators and supervisors must become familiar with the materials and philosophies of the new curriculum projects. Actual participation in the type of programme suggested here would be as beneficial to a principal as to a teacher.

While the programme described here has been structed around curriculum innovation in science, its potential benefits certainly are not limited to the teaching of science. Astute participants should be quick to recognize that the characteristics of scientific knowledge, the ways in which this knowledge is originally generated, and the ways it can be transmitted to children have parallels in many other disciplines. With perceptive teachers there is always a strong possibility that these new approaches to teaching science may be applied in other areas as well.

SUPPORTING PROFESSIONAL DOCUMENTS - 7

- DISCUSSION PAPER NO. 2

SOME THOUGHTS ON THE PLANNING OF THE TRAINING COURSE ON MODERN METHODS IN TEACHING AND EVALUATING ELEMENTARY/PRIMARY SCIENCE

By

Dr. R. Salinger, Associate Director
Peace Corps Malaysia

ASSUMPTIONS:

a. Participants will be educational leaders and Teacher Training specialist from member countries.

b. Contact is intended to expose participants to modern elementary education methods as exemplified by a wide variety of modern elementary curriculum materials Participants would later play a role in the preparation, modification or adaptation of elementary materials in their respective countries, and in the implementation of those materials.

c. The length of the course should be sufficient to provide ample opportunity for an unhurried study of the issues in question yet not so long as to incur a hardship in the member country agencies which must provide release time for attendance. A three month course might be more realistic, than one of six months.

d. The planning committee might provide the most useful service by preparing reasonably specific guidelines for the contact and conduct of the course but probably should not attempt a detailed week-by-week plan. The latter should probably be entrusted to the course director once he has been supplied the guidelines.

e. As a working principle it probably would be wise to accept the idea that all elements of the course should be conducted in the manner which is a model of the behaviour participants are being asked to examine.

FORM OF COURSE:

The general form of the course might follow a pattern from directed-nondirected-directed. That is, an opening portion intended as orientation and development of "psychological set", followed by a period of nondirected exploratory work with new materials, and a period finally of concentrated more directed study of the issues and implementation of the materials, methods, techniques, rationale and so on of the materials studied.

SUPPORTING PROFESSIONAL DOCUMENTS - 7 (Contd.)

GENERAL CONTENT:

Orientation - "psychological set."

Introduction to the purposes for such a course and examination of the implication and importance of educational planning, (i.e. the "Dr. Luz Sangalang Speech") the importance of planning, a priori for the intellectual development of other human beings, the development and economic implication of preparing a citizen that is literate and functional in a technological age without sacrificing all semblance of national and cultural heritage.

Exploratory phase

A cyclical approach to the examination of new materials involving four steps, science laboratory work, teaching laboratory, critique of teaching, and seminar. During their time the process content and methods used in the new materials would be examined. In addition, the rationale for these programmes, and indeed for science education at the elementary level, would be considered at this stage in the course, as well as the psychological basis for some of newly developed materials.

Directed phase

A concerted period of discussion and study with an experential base provided in the exploratory phase, Topics for consideration at this time might include the problems of evaluation, implementation and teacher training.

ISSUES:

Beyond the issues which arise from study of new materials are those which might be considered basic to any study of elementary science education.

Included might be:

Why teach science at the elementary level.
The non-equivalence of elementary and post elementary science teaching.
Sequential vs non-linear learning.
The pros and cons of behavioural objectionism.
Materials prepared for teacher use vs materials prepared for student use.
The role of reading in elementary science and the provision of auxiallary readings and so on.

SUPPORTING PROFESSIONAL DOCUMENTS - 7 (Contd.)

SPECIAL PROVISIONS:

Provision should probably made to insure at least three types of activity are included in the course aside from the regular content.

1. Adequate un-committed self study time.

2. Provision for trial of materials by participants with small groups of children.

3. Provision to examine and discuss on-going programmes being conducted or developed in member countries and to plan coordinated programmes where this is feasible.

4. Staff pre-planning before course.

PROGRAMMES THAT MIGHT BE REVIEWED:

African Primary Science Programme (EDC), Nuffield Junior Science, Philippines SSCD and ESS, AAAS - Science A Process Approach; Conceptually Oriented Programme for Elementary Sciences COPES, ESS, MINNEMAST, SCIS, and selected materials from SSCP and WIMSA

RESOURCE PEOPLE OUTSIDE REGION: (Some possibilities)

James Werntz (MINNEMAST)
David Hawkins (ESS)
Phillip Morrison (ESS)
Leonard Sealey
Paul David Merrick

LOCATION:

Although the RECSAM centre at Penang is slated to be the course location, other possibilities might also be considered. Whatever the location there are several criteria which have a bearing of the site selected.*

1. provision to house participants

2. access to suitable classroom and library facilities

3. access to an experimental school or provision for availability of children for teaching, laboratory and critique sessions.

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*RECSAM comment, the Centre at Penang has been selected and planned to meet all the above criteria.

SUPPORTING PROFESSIONAL DOCUMENTS - 8

DISCUSSION PAPER NO. 3

By

Mr. Hee Hoi Choo
Delegate from Malaysia

Duration: 2 - 3 months

Work to be done: During this period of 8 - 10 weeks, it is proposed that:

(i) participants be given a chance to be acquainted with work in elementary science done in

America	) e.g. ESS, Minnemast
	) AAAS, SCIS, Nuffield
United Kingdom	) CREDO, Curriculum
	) Study of the Bureau
Philippines	) of Public Schools and
	) U. P., African Study,
Africa	) etc.

(ii) participants have the opportunity of discussing with people closely involved with work of these organisations to help them to evaluate what is best for their local conditions and needs.

(iii) participants to be shown how a particular unit works.

(iv) actual/personal work with some of the units. This will allow for greater insight into the significance of the units, giving a chance to tackle problems arising, receiving advice wherever possible.

(v) participants be given guide-lines to draw up a pilot (or adaptation) scheme to suit their local needs.

(Discussion with people closely sharing the same problems)

(vi) Tests/trial teaching of some of their adaptations and time for further improvements if required.

SUPPORTING PROFESSIONAL DOCUMENTS - 8 (Cont'd)

(vii) participants be advised on means of evaluation and guided to produce some of their own forms of evaluation.

(viii) a short course on latest developments on educational psychology pertaining to child thinking, etc. (most probably at the beginning of the course).

(ix) group discussion on common regional problems.

SUPPORTING PROFESSIONAL DOCUMENT - 9

DISCUSSION PAPER NO. 4

A SUGGESTED PLAN FOR ADMINISTRATION OF CONCURRENT PROJECTS

TCE-1 AND TCM-1

By

Mr. H. F. Foncannon - AAAS Consultant

The chart illustrates a means by which several gains can be made by joint planning of courses TCE-1 (Elementary school Science) and TCM-1 (Elementary School Mathematics). It is based on the fact that many of the elements in both courses are similar, and that economics of time and staff can be achieved through combination of the two groups of participants for a significant part of the work. A greater advantage is that this procedure will help to impress upon the participants that elementary school science and mathematics are not discrete subjects but are closely related in many ways.

Following are comments on the numbered sectors of the chart:-

I - Orientation

Much, if not all, of the Orientation part of the programme will be more effective if it is carried out jointly. For example, an important topic will be the exchange of information about current practices and problems in the various countries of the region. Many of these problems and practices are common for science and mathematics in the individual countries, and much will be gained by discussing them together.

II - VI - Special Lectures and Discussions

Most of the special lectures and discussions will be conducted separately for the participants in the two groups, since they generally will apply specifically to either science or mathematics. For the most part, these discussions will follow lectures or demonstrations by consultants from outside the region who will be available for only a short time. An example might be a lecturer from Australia, provided by CREDO, who might present information on elementary school mathematics developments in that country. Another might be a specialist on evaluation of U.S. elementary science curricula, loaned for a week by the US/AID - India Science Education Programme. Discussions of new curricula, not dealt with in III and V would be held during this time,

SUPPORTING PROFESSIONAL DOCUMENTS - 9 (Cont'd.)

III - V - Practical Work - Curriculum and Teaching Materials

This activity would be the "core" of both courses and would be carried out primarily in the laboratory, and shop, and the demonstration school. It probably would occupy one-half of each day, e.g. science in the forenoon and mathematics in the afternoon. Under the close supervision of the Course Directors and the regional instructors, participants would actually be engaged in

(1) the adaptation of sample units from U.S. or U.K. curricula, (e.g. Science A Process Approach, Nuffield Elementary Science, etc.)

and (2) the development of experimental teaching units (including equipment), de novo.

Concentration would be on two or three leading U.S. or U.K. curricula. The purpose of this sector of the course is to give the participants solid and thorough experience in the techniques of adaptation and development of instructional materials, including the design and fabrication of teaching aids. Included will be production of film strips, film loops, overlays, etc. An objective is to provide a broad background of technical expertise for the participants so that they can give effective leadership to projects for the development or adaptation of curriculas and instructional materials in their own countries.

IV - Joint Sessions will consist of combined discussions of topics of common interest to participants of both courses, continuing throughout the duration of the project. They will be led, as appropriate, by the Course Directors, the instructors, or by consultants, both from within and from outside the region. Examples are:

(1) modern developments in learning theory as they apply to elementary school science and mathematics,

(2) special problems in curricular innovation, e.g. attitudes of faculty, administrators, and the general public,

(3) comparison of basic objectives of science and mathematics teaching at the elementary school level, e.g. for facts or basic skills only, for the mastery of science or mathematics "concepts", or for the development of proficiency in intellectual "processes."

The principal purpose of this series of seminars will be to broaden the perspectives of the participants in their views of the place and function of elementary school science and mathematics as a part of education as a whole beyond day-to-day classroom experience.

SUPPORTING PROFESSIONAL DOCUMENTS - 9 (Cont'd.)

PROPOSED SCHEMA FOR ORGANIZATION OF TCE - 1 and TCM - 1

Duration - Four Months

I - ORIENTATION - Combined Science and Mathematics Groups

II - MATHEMATICS - Lectures, Seminars, and Discussions on Special Topics (Staff and Outside Consultants)

III - MATHEMATICS - Practical Work in Laboratory, Shop, and Demonstration School on adaptation techniques

IV - SCIENCE AND MATHEMATICS (Joint Sessions)
- (i) Psychological and Philosophical Topics
- (ii) Teacher Training (Pre- and In-Service)
- (iii) Evaluation
- (iv) Other Common Topics

V - SCIENCE - Practical Work in Laboratory, Shop, and Demonstration School on adaptation techniques

VI - SCIENCE - Lectures, Seminars, and Discussions on Special Topics (Staff and Outside Consultants)

SUPPORTING PROFESSIONAL DOCUMENTS - 10

Discussion Paper No. 5

GUIDE IN THE PREPARATION OF ELEMENTATY SCHOOL SCIENCE MATERIALS

P.P. Jesuitas

Background

The Filipino child is and will be living in a world that is profoundly affected by change. The society that sets up expectations on him today will not be the same society that will guide him or influence his actions tomorrow. The field of science and technology, along with other fields of endeavor which shape up the social structure and climate, is advancing rapidly. And for the child to become an effective member of his society, he has to be able to cope with its demands.

There was a time when a grade school child was required to study some details about the structure and function of steam turbines, air ships, and other gadgets. Unfortunately, by the time he was physically and mentally prepared for more mature and responsible thinking and reflection, the gadgets were already outdated. This means that very little, if at all, of what he learned about them become useful in his later life. Today, one may likewise require the grade school child to study turbojets and space capsules for their own sake. If this is done, the child is likely to fall into the same said predicament his predecessors had fallen into.

It is clear then that the task of preparing a science curriculum for the Filipino child of today should consider content that has value for his world today and tomorrow. There can be more assurance of this if the curriculum materials are prepared according to recognised and accepted ideas about science education. This implies that the curriculum must fulfill the two major objectives of science teaching; the development in the child of (a) an understanding of the basic concepts (biological and physical) about the world in which he lives, (b) the skills (the processes of science) they will need to solve problems and to face the changes in his environment.

The Outline

Attached herewith is a brief outline of a proposed curriculum for Elementary School Science I to VI. It clearly centres around two major fields of science - the physical and the biological sciences. In the preparation of the outline, basic concepts in both fields were seriously considered. These concepts were spread out in the different grade levels in the order of their complexity. Certain themes were selected in order to unify these concepts together through the grades. For instance, the life science part of the outline is to be developed from the ecological viewpoint while the physical science part is to revolve around the concept matter and energy. The two fields

are, on the other hand, linked together by the expressed emphasis on the interaction between living and non-living things. One of the bases in the selection and placement of most physical science topics was in terms of whether or not these topics will support and enhance understanding of certain life science concepts.

The outline includes only the major topics under each unit. The major topics are generally arranged in sequence based either on their logical development or on their relative complexities. It starts in Grade I with the study of characteristics or properties of objects or things, moves on to the discussion of similarities and differences among them and ends up in Grade VI with the study of interrelationships and interactions on a much higher plane and encompassing much a broader area.

The Materials

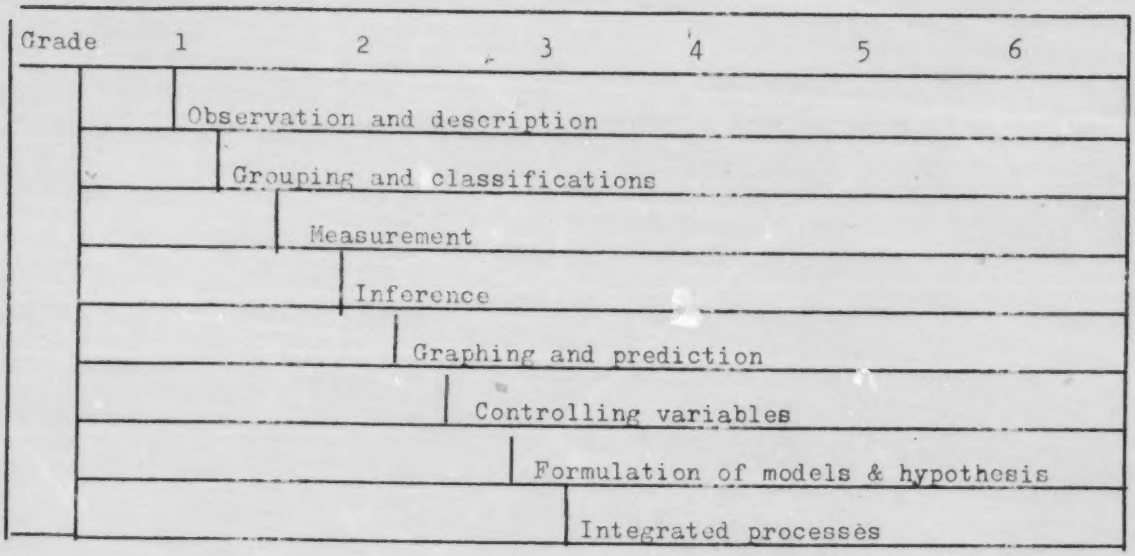
There are a number of major points which should be considered in the preparation of science materials among which are as follows:-

(a) Usefulness or applicability

(b) Workableness or practicability

What the child should learn in science should be useful or applicable to him. If in a science program, he is taught nothing except scientific facts, he becomes "literate: alright but not for long. This is because scientific facts are only tentatively accurate -- they change: Furthermore, what is learned in isolation with other aspects of living does not bear as much meaning and are easily forgotten.

Although the outline only indicates the basic topics included in each course, the significant aspect of the materials that should be developed from it should have the processes of science nearly interwoven with the basic science concepts. The simplest processes are introduced earlier and progressively the more complex ones are introduced in the succeeding years. The chart on the next page shows how the processes may be placed alongside with the child's growth. Developing understanding and skill in these processes in the child will offer him a greater promise of wider applicability of what he learns and its far-reaching effects on his future intellectual pursuits.



The teaching of the processes of science insures the development of the spirit of inquiry in the child. It can, however, be accomplished most effectively by engaging him in properly chosen series of activities to be done in and out of the classroom. His active involvement in the process of learning gives him optimum opportunity to enjoy his work in school as he learns how to manipulate objects and observe things around him, as he discovers certain relationships that exist between and among them, and as he controls or learn to control certain aspects of his environment in order to suit his needs and purposes.

All these point to the fact that whoever is going to undertake the task of preparing curriculum materials in science should for the most part think of activities which will enable him to achieve two things: to teach the child the processes of science and to equip him with a working knowledge of basic science concepts. A sophisticated laboratory equipped with all kinds of expensive gadgets is not necessary. In the first place, no school in any part of the country can afford it. In the second place, there is a wide variety of indigenous materials in and around the school which can just as well and perhaps more effectively serve the purpose.

ELEMENTARY SCHOOL SCIENCE I

I. Things Around Us

A. Properties of common objects (non-living)
B. Similarities and differences among objects

II. Living and Non-living things

A. Grouping things
B. Differences between living and non-living things

III. Plants and Animals

A. Differentiating plants from animals

IV. Diversity in Plants and Animals

A. Diversity among plants
B. Diversity among animals

V. Relationships Between Plants and Animals

A. Plants and animals as food
B. Other types of animals dependence on plants and other animals

VI. Relationships Between Organisms and Physical Environment

A. Plants and physical environment
B. Animals and physical environment
C. Man and physical environment

VII. Solids, Liquids and Gases

A. Grouping objects
B. Common properties of solids and liquids
C. Gases

VIII. The Earth We Live In

A. Land - the solid portion of the earth
B. Soil and rocks
C. Water - the liquid portion of the earth
D. Air - the gaseous portion of the earth

IX. Things Up in the Sky

A. Looking up
B. Motion
C. Measurements of lengths and distances
D. Motion of things in the sky

X. Day and Night

A. Daytime and nighttime
B. Time and temperature and the apparent movement of the sun

ELEMENTARY SCHOOL SCIENCE II

I. Forces

A. The Meaning of force
B. Forces applied by the earth - "earth pull"
C. Using spring to measure force
D. Using the equal arm balance
E. Measuring the earth pulls (or heaviness) of liquids

II. Similarities in Plants and Animals

A. Similarities and differences in plants
B. Variations in plants of the same kind
C. Similarities and differences in animals

III. Changes in Plants and Animals During Growth

A. Changes in plants as they grow
B. Changes in various animals as they get older

IV. Our Senses and our Surroundings

A. Our senses and sense organs
B. Sight
C. Taste
D. Perception of odors (smell)

V. Sound

A. Production of sound
B. Transmission of sound
C. Characteristics of sound

VI. Light and Temperature

A. Sources of light and their characteristics
B. Measurement of temperature
C. Light as related to heat

VII. Water Cycle

A. Evaporation of water
B. Condensation

ELEMENTARY SCHOOL SCIENCE III

I. Constant Speed

A. Measurement of speed

II. Volume and its Measurement

A. Measurement of volumes of solids
B. Measurement of volumes of liquids
C. Calculating volumes of solids and containers

III. Reactions of Plants and Animals to Changes in the Environment

A. Reactions of plants to changes in the environment
B. Reactions of animals to changes in the environment

IV. Communities

A. Plant and animal interactions in communities
B. Physical factors affecting communities
C. Conserving plant and animal life in a community

V. Erosion and Deposition

A. Erosion - the effects of moving water
B. Deposition

VI. Light

A. Light and seeing
B. Reflection of light

VII. Shape of the Earth

A. Understanding shadows
B. The earth is like a ball

VIII. Motion of Heavenly Bodies

A. The Stars
B. The Moon

ELEMENTARY SCHOOL SCIENCE IV

I. Plants as Primary Producers

A. What is food?
B. Starch as food produced by plants
C. Raw materials for starch production
D. Storage and use of starch by plants

II. Animals as Consumers

A. Food-getting
B. Digestion of food
C. What happens to digested and undigested food

III. Exchange of Gases Among Plants and Animals

A. How do plants use and produce gases
B. Respiration in animals
C. Interdependence of plants and animals
D. Transpiration in plants

IV. Heat and Temperature

A. Heat exchange in some solids and liquids
B. Heat vs. temperature

V. Effects of Heat

A. Effects of heat on liquids
B. Effects of heat on solids
C. Effects of heat on gases

VI. Sources of Heat

A. The Sun
B. Man-made sources of heat
C. The interior of the earth

VII. Sound

A. Production of sound
B. Characteristics of sound
C. Transmission of sound

ELEMENTARY SCHOOL SCIENCE V

I. Changes in Motion

A. Motion can change in speed and direction
B. Circular and vibratory motions
C. All changes in motion caused by forces
D. Effects of no force on a body
E. Effect of two or more forces applied to an object

Depends on: direction, magnitude, and point of application

F. Force required to stop or start motion of an object depends on its heaviness and speed and also on the time in which the change occurs

II. Energy

A. What is energy?
B. What kind of things can produce motion?
C. Things that can produce motion cannot continue to do so without an input of energy

III. Do Living Things Come From Living Things

A. Whare do living things come from?
B. Implications to health of the habits of houseflies

IV. Animals Reproduce and Increase in Number

A. Reproductive behavior of some animals
B. How some animals are born
C. Other ways of reproduction

V. Grouping Animals

A. Based on morphological characteristics

VI. Plants Reproduce and Increase in Number

A. Observing the growth of new plants
B. Observing how plants are propagated by pollination
C. Observing other ways of repoduction

VII. Grouping Plants

A. Based on reproductive structure

VIII. Seasons

A. Angle of sun at different times of the year
B. Variation in places where the sun rises and sets

IX. Seasons and Abundance of Plants and Animals

A. Differences in the time of flowering and fruiting of certain plants
B. Differences in the time of breeding, spawning of certain animals

ELEMENTARY SCHOOL SCIENCE VI

I. Growth of a Population

A. A plant population
B. Water flea population
C. The fruit fly population

II. Relating the Dynamics of Population Growth to the Human Population.

A. Analysing population growth of the Philippines
B. Comparing regions of the earth in population growth rates
C. Factors affecting population growth rates
D. Predicting trends and accounting for differences
E. Mechanisms for keeping population growth rates low

III. The Human Organism and Disease

A. Analysing health statistics of the Philippines
B. The development of the germ theory
C. Body defenses
D. Pollution

VI. Ecology of a Rice Paddy

A. Analysing data on food and population in the Philippines
B. Identifying living forms in a flooded rice paddy
C. Influence of factors on production

V. Bending of Light

A. Tracing the path of beams of light incident on some reflecting surfaces
B. Is the direction of light changed when it passes from one medium through another

VI. Mixing Substances

A. What happens when some solids are placed in liquids
B. What happens when some liquids are poured into other liquids
C. Chemical changes produced by mixing materials

VII. Electricity

A. What is an electrical circuit
B. Producing electricity
C. Electromagnetism

APPENDICES

APPENDICES

	Page No.
A - Programme Of Primary Science Planning Workshop	59
B - Proceedings Of The Primary Science Planning Workshop	60 - 64
C - List of Participants	65
D - Organising Committee	66
E - Addresses by	
1. Hon. Juan L. Manuel	67 - 68
2. Dr. Liceria B. Soriano	69 - 70
3. Dr. Dolores Hernandez	71 - 73
F - Background Data on RECSAM - A Brief Description Of The Major Functions Of The SEAMEC Regional Centre For Education In Science & Mathematics	74 - 77
G - History of RECSAM Development	78 - 80
H - Bibliography Of RECSAM Reports	81 - 82
I - Report Distribution	83
J - Press Communique	84

APPENDICIES

This section of the report contains the administrative details of the Primary Science Workshop, including programme, proceedings and addresses. Additional supporting information on RECSAM is also included for the reader not familiar with the background of the Regional Centre.

Appendix A

Primary Science Planning Workshop
June 24-28, 1969, Manila, Philippines

PROGRAMME

Tuesday, 24th June 1969

8:30 - Registration and Distribution of Documents

9:30 - Opening Ceremony

- Welcome Address - Dr. Liceria B. Soriano
  Vice Chairman, Steering Committee, RECSAM

- Address - Hon. Juan L. Manuel
  Director of Public Schools and concurrently
  Undersecretary of Education

- Remarks - Dr. Dolores F. Hernandez
  Director, Science Education Center U.P. and
  Chairman, National Coordinating Committee, RECSAM

- RECESS

10:30 - Plenary Session
Work Session I

- Orientation - Mr. Aurelio Juele
  Chairman, Primary Science Planning Workshop

- Discussion of Guidelines and Objectives of the Workshop

12:00 - Luncheon Reception - By Undersecretary Juan L. Manuel

1:30 - Work Session II
Resource Persons:

Prof. Profirio Jesuitas
Sister Odiliana O.S.B.
Dr. Luz Sangalang

Discussion of working paper.

Appendix B

PROCEEDINGS OF THE PRIMARY SCIENCE PLANNING WORKSHOP
June 24 - 28th, 1969, Manila, Philippines

1. Opening Ceremony

The Primary Science Planning Workshop of the SEAMEC RECSAM was officially opened at 9.30a.m., June 24, 1969, in the Bureau of Vocational Education Conference Room, Department of Education, Manila, Philippines, by Honorable Juan L. Manuel, Director of Public Schools and concurrently Undersecretary of Education, Philippines.

Addresses (See appendices E - 1, 2 & 3) were delivered by Dr. Liceria B. Soriano, Assistant Director of Public Schools and Vice-Chairman, RECSAM Steering Committee; Hon. Juan L. Manuel; and Dr. Dolores F. Hernandez, Director, U.P. Science Education Center.

2. Election of Secretary and Rapporteur

Mr. Effrain Abracia of the Philippines and Mr. Chiu Hock Seng of Singapore were chosen Secretary and Rapporteur respectively.

3. Background Information and Guidelines for the Workshop

Mr. Aurelio Juele, Superintendent of Science Education of the Philippine Public Schools and designated Chairman of the Primary Science Planning Workshop, presented the background for the workshop (See Supporting Professional Document - 1, 2). He pointed out that the Final Development Plan of RECSAM (Part I - Operationa Plan and Part II - Supporting Documents), which is the official guide in the implementation of Centre policies and projects already describes the nature, objectives and duration of the proposed course, TCE-1 Modern Methods in Teaching and Evaluating Elementary Science, which this workshop intends to develop further. The purpose is to be able to launch this training program according to schedule in January 1970.

4. Working Papers

With a view to simulate thinking and discussion on the goals of the workshop, the Chairman presented some working papers (See Supporting Professional Documents- 3, 4 and 5) with suggesions regarding the scope of the course, its nature, and how it may be scheduled over a six-month period. These simulated discussions and other papers were presented (See Discussion Paper No. 1, 2, 3) by Dr. Richard F.P. Salinger and Mr. Hee Hoi Choo, respectively.

Appendix B (Cont'd.)

5. Work Sessions

The body arrived at some agreement regarding the duration of the course, the important phases of the course, some assumptions of issues and broke into four groups to develop further the details of the course.

The description of the course is on page 5 of this report.

6. Work Groups

Group	Discussion Topics	Participants
I	. scope of content . methods and processes . materials improvisation	) Dr. Salinger) Dr. Sangalang) Mr. Hee) Prof. Jesuitas
II	. learning theories . evaluation	) Mr. Chiu) Mr. Hikmat) Dr. Foncannon) Sister Odiliana
III	. adaptation techniques . teacher/training techniques . problems of innovation	) Mr. Hottiaratchy) Mr. Abracia) Mr. Chamnong) Dr. Foncannon
IV	. time duration . financial consideration . staffing	) Mr. Ganasalingam) Mr. Juele

7. Observation of Demonstration Classes

The group also took time to visit the University Elementary School (U.P.) where they were shown some excellent science lessons based on the U.P.-SEC Program being conducted by the teachers of the school. After the demonstrations, a discussion was conducted by Professor Jesuitas with the Principal and the teachers of the school to answer questions put up by the group. The discussion was stimulating and interesting.

8. Adoption of Report

The report as drafted was adopted.

Appendix B (Cont'd.)

9. Closing Ceremony

Statements were made by:-

- Mr. Aurelio Juele
  Chairman,
  Primary Science Planning Workshop

- Mr. C. Ganasalingam,
  Programme Co-ordinator,
  SEAMEC - RECSAM

- Dr. Howard F. Foncannon,
  Consultant, AAAS.

- Dr. Narciso Albarracin,
  Director,
  Bureau of Private Schools.

Notes on the Working Sessions of the Workshop

Work Session I

1. The orientation on the goals of the planning workshop was given by Mr. Juele. This was followed by a discussion of the participants thinking on the value of the project (6 month training in Elementary Science) in their respective countries.

   a) Dr. Sangalang and Prof. Jesuitas (both of the Philippines) discussed their experiences with the teacher-training programs.

   b) Mr. Chin opined that the training program should put more stress on teaching science (how) and cut down the proposed 4 weeks for psychology of learning.

   c) Dr. Salinger requested clarification of the intended participants of the training program. Mr. Juele pointed to the description of participants in MP (Supporting Document - 2).

   d) Dr. Hernandez inquired from Mr. Ganasalingam, RECSAM Programme Coordinator about the planned conference for school administrators in science. Dr. Ganasalingam gave three proposals for three groups of science education leaders including school administrators.

   e) Dr. Soriano stressed the importance of psychology background for science teaching and giving sufficient emphasis to this in the training program. She suggested combining methods and processes in the program experiences.

   f) Talking about psychologists to serve the project, Mr. Ganasalingam opined that he must come from the region - Eastern thought and social background is much different from American or European.

Work Session II

1. Mr. Juele introduced Sister Odiliana and Sister Belarmino.

2. Sister Odiliana, in talking about her experiences and observations in their summer training, mentioned that she believed

   (a) teachers need psychological bases of science teaching

   (b) five weeks of training was very insufficient to train teachers in the science processes

   Prof. Jesuitas suggested that the "psychology" phase of the training he called "psychological and philosophical background of science education". Together with Dr. Sangalang, he gave his observations and inferences from the post NSDB-UP-SSC summer project.

3. A variety of ideas and opinions were given relative to length of training program in relation to the quality of participants to be sent to the training. This will be a training program for teachers of teachers.

4. Dr. Foncannon of NSF, says that his office - AAAS - will be willing to help science improvement programs in terms of ideas, materials, and services.

5. Consensuses:

   (a) Consider time allotment for the course
   (b) Consider nature of participants
   (c) Consider extent of the course (coverage)
   (d) Consider experiences to be emphasized (i.e., relative empashs of the covered materials)
   (e) Consider specifications for facilities to be required

   It was also suggested that the training program should provide time for participants to do some self-study and research. Also time for individual meeting with the professor.

Appendix C

PRIMARY SCIENCE PLANNING WORKSHOP
Manila, Philippines
June 24 - 28, 1969

PARTICIPANTS

Indonesia:	Mr. R. Hikmat Secretary Educational Research and Development
Malaysia:	Mr. Hee Hoi Choo Ministry of Education
Singapore:	Mr. Chiu Hock Seng Teachers' Training College
Thailand:	Mr. Chamnong Praiyamkhae Elementary Supervisory Unit Ministry of Education Bangkok, Thailand
Philippines:	Mr. Aurelio Juele, Workshop Chairman Bureau of Public Schools
	Mr. Efrain Abracia Bureau of Public Schools
	Sister M. Belarmine, O. S. B. Saint Scholastica College
	Sister Odiliana, O. S. B., Resource Person Saint Scholastica College
	Prof. Porfirio Jesuitas, Resource Person University of the Philippines
	Dr. Luz Sangalang, Resource Person National Science Development Board
	Dr. Dolores F. Hernandez, Consultant University of the Philippines
	Dr. Liceria B. Soriano, Consultant Bureau of Public Schools
RECSAM:	Mr. C. Ganasalingam, Programme Co-ordinator
Ceylon:	Mr. Chandrasena Hettiarachchi, Adviser
AAAS:	Dr. Howard F. Foncannon, Consultant
Peace Corps/Malaysia:	Dr. Richard F.P. Salinger

Appendix D

ORGANIZING COMMITTEE

Mr. Aurelio Juele
Chairman
Primary Science Planning Workshop
(Assistant Chief,
Special Subjects and Services Division
Bureau of Public Schools)

Co-ordination, Arrangement, and Reception

Mr. Julio A. Barona, Chairman
Mrs. Corazon D. Legaspi
Mrs. Rosalina R. Kintanar
Miss Carolina V. Perez
Miss Raquel A. Valle
Mr. Amando Almario

Documentation

Mrs. Filipinas L. Enriquez, Chairman
Miss Regina Tomelden
Mr. Ceferino Aranda
Mr. Dominador Balancio
Mr. Jose A. Non
Mr. Eulogio Pascual

Appendix E

1. Address by Hon. JUAN L. MANUEL

Director of Public Schools and Concurrently Undersecretary of Education, at the Primary Science Planning Workshop of the Regional Centre for Education in Science and Mathematics held in cooperation with the Republic of the Philippines at Manila on June 24-28, 1969.

The Steering Committee of the Regional Centre for Eudcation in Science and Mathematics under the SEAMEC has placed upon the Philippines the task of exercising a leadership role in the initial operation of the Centre by deciding in its 5th meeting at Tokyo, March 30 to April 7, 1969 that a Primary Science Planning Workshop be organized and chaired by one from the Philippines. This move was made in recognition of the experimental projects in elementary science that are making some headway in this part of Asia. Because of his deep involvement in the multifarious science programs in this country, Mr. Aurelio Juele who was to be Chairman of the workshop could not go to Penang; therefore the plan necessitated an alternative option of holding the workshop here in Manila.

I would like to believe that the decision of the Steering Committee is correct. We are in the initiatory process of innovating the science and mathematics program. In the process of learning more, we would like to share with the region our experience. It is with a great sense of pride therefore as well as a deep concern for the joint welfare of the Southeast Asian Region that the Philippines is gladly hosting this workshop in the spirit of regional cooperation to which the SEAMEC member countries have pledged.

True it is that the Philippines has started innovative projects ...ch in developing curriculum materials and teacher training in physics, chemistry, biology, mathematics, general science and elementary science. The best known of these is the Biology project of the Science Education Center, although greater stride in implementation is in Elementary Science using the Bureau of Public Schools-Peace Corps materials in a wider scale in the public schools. However, the number of experts and leaders especially in the field of elementary science is small in comparison to the needs of our large educational system that boasts of more than seven million school population and 220,000 school teachers. Among the few leaders that we have in the country some are here with us today and while it is not possible yet at this stage of our development to release their services to the Centre for regional use without a setback in our national programs, special arrangement can still be made for the Philippines to be able to serve the Centre. Holding the workshop here in Manila seems to be the best possible way by which we can assist in the work of the Centre in the area where we have made some advances.

Mr. Chang Min Kee, former Chairman of the Steering Committee of RECSAM, very aptly expressed the role and contribution of each member country when he said that "at best the Regional Centre will act as a catalyst in stimulating action in the region and in disseminating the latest development in respect of Science and Mathematics. Where a member country has taken the initiative, as for example the Philippines has in respect to Biology and Thailand in Chemistry, the Regional Centre would like to request the educators of the Philippines and Thailand to help direct and implement a regional programme for the improvement of the teaching of Biology and Chemistry in the region. In other words, the responsibilities of the member countries in the regional project are planned on a two-way traffic basis and the main responsibility of the Regional Centre is to mobilize the best talents, both within as well as outside the region, for the furtherance and improvement of Science and Mathematics education in the region."

Along this concept of two-way responsibilities, last April and May Dr. Dolores Hernandez, Director of the Science Education Centre, U.P. conducted at Penang a course on Modern Biology for the leading teachers of the six member countries of SEAMEC. This time our assistance is sought in primary science. The combined and cooperative efforts of educators from each member country in the region, which Mr. Min Kee "had every confidence to be forthcoming," have come to Manila. These are the best talents within the region. From outside the region Dr. Foncannon of AAAS and Dr. Hettiarachchi of Ceylon have come to share their expertise.

You are all welcome to our country. While you are here, we hope that you will have the chance to see at close range the pioneering work that has been done in Primary Science and if you have the time, in the other science fields. I hope classes are going on, for there are teachers actually using the new materials whom you can observe.

We thank RECSAM for giving us the opportunity to do our share, small as it may seem in comparison to the gigantic tasks the Centre eventually hopes to achieve, in the fulfillment of RECSAM's objectives.

I understand that your important mission here is to work out measures, plan a program of activities, call it a course if you may, in order to launch in January, 1970 the first of a series of courses to be offered by RECSAM in Primary Science, with a view of taking advantage of a workshop on Science - A Process Approach offered by Dr. Foncannon. The Bureau of Public Schools and the Science Education Center, U.P. are closely cooperating in serving your needs. With my fervent hope that you will be able to realize the purposes of this meeting, I now declare the Primary Science Planning Workshop open. Thank you.

2. Welcome Address by Dr. LICERIA B. SORIANO

Assistant Director of Public Schools and Vice-Chairman of the Steering Committee for the Regional Centre for Science and Mathematics, at the Primary Science Planning Workshop of the Regional Centre for Education in Science and Mathematics held in cooperation with the Republic of the Philippines at Manila on June 24-28, 1969.

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Honorable Undersecretary Juan L. Manuel,
Mr. T. B. Slattery,
Mr. Chandrasena Hettiarachchi,
Dr. Howard F. Foncannon,
Mr. C. Ganasalingam,
Delegates from the [illegible]
Ladies and Gentle[illegible]

In my capa[illegible]ssistant Director of Public Schools for the Philippines and as [illegible]hairman of the Steering Committee for the Regional Centre for Science an[illegible]athematics located in Penang, I extend to you our most sincere and cordi[illegible] welcome. We consider it an honor for our country to have been chosen the site of the Planning Workshop for the course in Primary Science to be offered in the Centre this coming scholastic year under the chairmanship of Mr. Aurelio Juele, the other Philippine member to the Steering Committee.

We offer to you our total, though meager, resources and our best elementary science teachers from both the public and private schools. You will see among you here, Dr. Dolores Hernandez, Director of the Science Education Center, Chairman of the National Coordinating Committee and Member of the Task Force. Dr. Luz Sangalang, Chief Education Officer of the NSDB and also member of the Task Force is here as well as Mr. Efrain Abracia, Sister M. Belarmine and Sister Odiliana, both of the Saint Scholastica College, and Prof. Porfirio Jesuitas, of the University of the Philippines.

We have made available for your use, if necessary, copies of the curriculum materials that we have developed with the assistance of the Peace Corps and those produced under the leadership of the SEC. We do hope that you will have the time to examine them and make suggestions for their improvement. Our most ardent wish, however, is that you will be able to accomplish the objectives for which this workshop has been organized and that the course for Penang, the general framework of which will be evolved here, will serve the best interests of our individual countries in particular and of the region in general.

Appendix E (Cont'd)

At this juncture, I should like to inform you that interest in an international conference in elementary science has been shown by UNESCO and that exploratory talks are now being made with the UNESCO officials concerned for the holding in Manila of such a conference in early 1970. It would be well, I believe, to look forward to this and see to it that what skills will be derived and what materials will be produced by our participants in Penang will prepare our region to make worthwhile contributions to the forthcoming international conference.

Finally, may I tell especially to those who are visiting here for the first time that our countries are quite similar in many ways and that we will try our best to equal the warm friendship and hospitality that we have enjoyed in your respective countries, and so please do not hesitate to let us know your needs while you are in the Philippines.

Greetings to you all and may you enjoy your brief stay.

Appendix E (Cont'd)

3. Remarks by Dr. DOLORES H. HERNANDEZ

Director, Science Education Center, U.P. and Chairman, National Co-ordinating Committee, RECSAM, at the Primary Science Planning Workshop of the Regional Centre for Education in Science and Mathematics held in cooperation with the Republic of the Philippines at Manila on June 24-28, 1969.

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We have here in the person of Mr. Aurelio Juele a brilliant organizer - when he came to see us at the Science Education Center about this meeting, he had a program for today's sessions all worked out - including what each person would be talking about except for my part. He told me I could talk about anything I wished. That was nice - but I find myself in a quandary - because what I thought would be appropriate topics for this program had either already been said or will be talked about in the succeeding sessions.

Since I am a member of the Task Force, and have recently helped to plan and conduct a short-term program in Penang on the Philippine adapted version of the BSCS materials, I think this group would be interested in hearing about these experiences.

First, as a Task Force member, I have been involved in a series of planning sessions on the projects of the Regional Center for Education in the Sciences and Mathematics (RECSAM), which as you all know are of four types - the projects I mean. These are training projects, research, development and evaluation projects, special services projects, and the information center and clearing house.

The course which will be planned in this conference is a training project and is the 1st of the 6-months long training programs envisioned for each of the subject areas: physics, chemistry, biology, mathematics, and elementary school science. For each of these subject areas, planning sessions have previously been held, the findings of which could serve as part of the guidelines for the present planning conference.

One of the first sessions the Task Force had in Penang was to plan guidelines for national seminars which were intended to serve each country's needs in science and mathematics education. These in turn formed the basis on which the regional seminars held in Penang determined the common areas and the most urgent problems in science and mathematics education for the Southeast Asian region. On this basis then, the Task Force, in a series of meetings, drew up the project plans. The biology session which I attended worked out rather detailed proposals which could very well serve as guidelines for whoever will be asked to plan and execute the 6-months training course for biology teachers. Similarly, the results of the earlier Task Force meetings in elementary school science might serve as well. The point

Appendix E (Cont'd)

I wish to make here is that it is wise to provide some kind of continuity in thinking, in planning, and in the execution of projects - this is not an easy thing to do, considering the many countries involved and the different participants who come to such sessions. We appreciate, therefore, the wisdom of the RECSAM staff in selecting one of the Steering Committee members, Mr. Juele, to coordinate this conference since he would help to provide the needed continuity in this endeavor.

I would like to mention now a few of the problems we encountered in conducting the short-term training session in biology which was recently held in Penang. One of the things included in the biology program were in going sessions in course situation: in a laboratory setting; without a laboratory setting - mainly an intellectual activity; and lastly through films designed specifically for this purpose. I ordered these films early in January for our teacher education program in the U.P. but I intended to use them in Penang. Up to the day we left for Penang, I was hoping to receive them - to this date, they have not been received.

Another example of good planning that went away was our ISCS orientation program - a two week session which started May 26 and ended June 7. All things needed for this program were sent to us by air freight and were scheduled to be here at least a week before the session started. Fortunately, the supervisor who conducted the program had been asked, according to plans, to come a week early (for his own orientation to our local situation). Fortunately too the Bureau of Public Schools and the Science Education Center had available staff who could be assigned full time to assist him and then looked for a shop in which they could work. So, this supervisor and the four teachers worked together for several days making equipment for the orientation program which was far-sighted by them. The books arrived during the middle of the program and the equipment arrived on the last day, but the orientation sessions went on smoothly in spite of such major setbacks.

A course planned for an elementary school science program would involve exposure of the participants to various types of new courses in ESS. This would mean providing a variety of books, equipment and supplies so that the participants can familiarize themselves with the materials through actual experience in their use. For a 6-months course, this may mean a tremendous job which will take months of preparation, of making lists, of ordering, and of constructing equipment. The last activity is necessary if local curriculum materials are to be used and I assume they will be, because many elementary school science activities developed locally utilized improvised and home-made type of equipment.

Appendix E (Cont'd)

Another problem we faced is that of personnel to conduct the course. Ideally, we envisioned a program conducted by a subject specialist, an educator and an experienced high school teacher - to adequately take care of various aspects of the program. But things did not work out as planned. We did get through people to Penang to conduct the course - Dr. Larsen, a biologist, Mrs. Ryes, the high school teacher and I, the science educator. Unforeseen events delayed the opening of the course in Penang - by the time it started, my leave was up. So, I did in one day what should have been spread out over several days. The biologist and high school teacher were however the mainstay of the course - and so the ommissions were minors. I should also point out that with a group of top educators/teachers as participants, and with sessions running all day - the two people who conducted the course had to keep on their toes all the time and were quite exhausted at the end of the 3-week session. Hence, the matter of having sufficient personnel is crucial - a 6-months intensive course is equivalent to 3-4 courses and planning of personnel should consider their report.

These are just a few of the problems to share with you at the risk of summing pessimistic. But it is the consideration of such problems which would make planning realistic and flexible.

Appendix F

A brief description of the major functions of the SEAMEC Regional Center for Education in Science and Mathematics *

During the interim phases of Center operation - the Training and Special Services function will necessarily be carried on in parallel with (and perhaps somewhat independently from) the Research Function. As a Regional data base on local resources and materials, teaching techniques and instructional materials, etc. is established and evaluation programs conducted, the Research Group, in concert with Training, would begin to establish new guidelines and revise subject area content for the training activities of the Center. The research function would then (quite properly) lead the other Center functions in terms of providing relevant inputs (other than pure subject area content) to them. This function would also work with Training to set up general evaluation guidelines plus more specific course evaluation programs and to devise methods to obtain feedback on course effectiveness.**

Major Functions of Research and Development

- Research into Guidelines for establishing National and Regional Science Education policies.
- Technical awareness of Regional Scientific Research and Development programs.
- Advisory role - adaptation of scientific educational Research and Development information to serve Regional needs.
- Support and consultation in establishment of National Science Centers and National Scientific Research and Development policies.
- Long Range programs to provide guidance for Regional Science Education policies and Guidelines for future co-operative Research and Development programs.

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* Excerpt from Final Development Plan for the SEAMES Regional Centre for Education in Science and Mathematics Part I - Operation Plan, November 1, 1968.

** Two kinds of evaluation are hence involved: 1) Evaluation of syllabi as to content, relevance of examination, etc. and 2) Evaluation of the effectiveness of Center projects in general.

- Seminars and courses in methodology of Research and Development and Evaluation (co-ordinated with Training Division).

- Development of principles of evaluation, specific evaluation of the Center's Training programs, instructional aids, and assistance in planning future pilot projects.

- Keeping up to date with new technological aids to education and continually appraising their appropriateness for application to Regional problems:-

  These include: educational television, teaching machines, programmed and computerized instruction, future use of computers for research and development, for administration, for storage, retrieval and distribution of information, and for student testing (as currently being done by Malaysia).

- Research into Instructional Design, (translation of relevant scientific knowledge into instructional practices), curricula development and evaluation techniques.

- Research in co-operation with Special Services into equipment and instructional materials needed to supplement new syllabi, including such specifics as:

  a. - to develop apparatus and equipment for science and mathematics teaching and to advise on improvisation and construction of teaching materials from locally available resources within the region.

  b. - to test and evaluate the suitability and effective use of such prototype equipment and provide manuals and teachers' guides with the assistance of the Research and Development Division.

  c. - to disseminate information on the suitability and use of such locally produced equipment to schools and education authorities and other interested parties.

  d. - work with Special Services to construct suitable prototype science kits to match syllabi for multiple experiment for use in rural schools.

e. - Provide support to Special Services in development of mobile travelling units to illustrate effective use of such equipment in teaching science and mathematics.

Special Services

The Special Services function of the Regional Center would cater to the following main areas:

(1) Provision of consultant services to help solve certain national problems in curriculum development, adaptation, evaluation, etc.

(2) Assistance to National programs in the development evaluation of prototype equipment and instructional materials from locally available resources.

(3) Specialist support in planning Science Fairs, setting up exhibits and museums, etc.

(4) Inputs to Regional projects based on knowledge of special National problems.

It has become evident from the National and Regional Seminars that many specific National problems can best be solved by sending a specialist to the problem rather than vice-versa. Some problems the delegates believed could best be solved on a national basis will require technical assistance from the Regional Center. Hence this function will probably start out by providing specialist consultant service to the member countries as required by their own peculiar needs in Science and Mathematics education. These services might take the form of special short courses, workshops on instructional materials in the design and effective use of improvised laboratory equipment from resources locally available, or might be more directly related to the solving of specific problems.

Information Center and Clearing House

The major activities of the Information Center, as they have evolved from the various Seminars and Third Task Force meeting will include the following:-

- Library - including books, references, journals, subject area bulletins, reports and abstracts of reports (for each subject area and multi-disciplined subjects).

Appendix F (Cont'd)

- Reports Production and Distribution Center for locally generated material, newsletters, monographs and other items.
- Graphic Arts and instructional materials fabrication.
- Audio-Visual aids center.
- Support to the Training, Research and Development, and Special Services Functions as required.
- Public Relations responsibility, including press releases, publicity, etc.

This latter Public Relations function of the Information Center is critical in that it will in effect help create the external image of the Regional Center through its public relations activities and its newsletters, reports and other disseminated material. This function is therefore vital to long range success and should be planned and staffed with extreme care.

Appendix G

HISTORY OF RECSAM DEVELOPMENT

1. History

A. Feasibility Study 1966:

1.1 During the part of 1966, SEAMES appointed a Feasibility Team, composed of Dr. W. Eilers, Representative of Asia Foundation, Malaysia, Dr. H. Foncannon of the National Science Foundation, United States of America and Mr. C. C. Little of the Summer Science Institute Programme, USAID/ED, India, to conduct a preliminary study relative to a proposed Regional Center for Education in Science and Mathematics for South-East Asia. The Report of the Feasibility Team was examined at the Technical Workshops held in Kuala Lumpur, Malaysia, in July 1966 and further discussed by a Select Committee of Permanent Secretaries of the Ministries of Education of member countries on 17th to 21st October, 1966, in Bangkok. This proposal together with nine other proposals were then presented to the Second Conference of the Ministers of Education held in Manila in November 1966, at which Indonesia attended for the first time.

1.2 Five regional projects were approved at this Second Conference, namely the Asian Institute of Technology in Bangkok, Tropical Medical Centers in the member countries, a Regional Center for Agriculture at Los Banos, Philippines, a Regional English Language Center at Singapore and a Regional Center for Education in Science and Mathematics at Penang, Malaysia.

B. First Pre-Project (Interim) Phase - May to December 1967:

1.3 In May 1967, the Steering Committee for the proposed Regional Center for Education in Science and Mathematics, composed of two delegates from each of the six participating countries, held its First Meeting in Penang, Malaysia. At this First Meeting, the Steering Committee recommended a Budget of US$72,423 to carry out certain pre-project activities to enable it to identify the problems of teaching Science and Mathematics in this region and to prepare a Plan of Operations for the Regional Center.

Appendix G (Cont'd)

1.4 Following upon a request made to the U.S. Government through SEAMES for the necessary funds to carry out these pre-project activities, a letter of agreement was signed on the 30th June 1967 between the Hon'ble The Minister of Education, Malaysia, and the U.S.A. Ambassador to Malaysia, approving a budget of US$50,000 towards financing the following pre-project activities of the Regional Centre for the interim phase, July to December 1967.

1.4.1 The First Meeting of the Task Force, composed of top-level educators from the member countries, representing the five subject areas of Biology, Chemistry, Elementary Science, Mathematics and Physics, at Singapore from 26th to 27th June, 1967, to draw up guide-lines for National Seminars in Science and Mathematics to be held in all member countries.

1.4.2 Six National Seminars in Science and Mathematics in the six participating countries were held between July 20 and August 15, 1967.

1.4.3 A Regional Seminar in Science and Mathematics at Penang, Malaysia, from 12th to 15th September, 1967, attended by five delegates from each of the six member countries to study the reports of the National Seminars and to draw up program activities for the Regional Center.

1.4.4 The Second Meeting of the Task Force in Penang from 16th to 19th September 1967 to draw up a Draft Plan of Operations for the Regional Center.

1.4.5 The Second Meeting of the Steering Committee held in Bandung, Indonesia, from 16th to 19th October 1967 to consider the Draft Development Plan of Operations for Submission to the Third Conference of Ministers of Education.

C. Second Pre-Project (Interim) Phase - January to June 1968:

1.5 At the Second Meeting, the Steering Committee approved the Preliminary Draft Development Plan, prepared by the Interim Project Office, for submission to the Third Conference of Ministers of Education in December 1967. At the same time, it requested extension of the present interim phase to June 1968 in order to refine the Draft Development Plan and to work out details of the various specific proposals, including the Architectural and Engineering Studies.

1.6 The Ministers of Education (SEAMEC) at their third conference held at Singapore, February 6th-9th, 1968, approved the Draft Development Plan of the Centre and also approved the request for the extension of the Pre-project Phase to June 1968 in order to enable the Project Office to refine the Draft Development Plan and to work out the details of the specific projects in the plan.

1.7 At the Third Task Force Meeting held in Penang, April 30 - May 3, 1968, finalized project proposals were developed by the Task Force, assisted by a number of key consultants. These finalized project proposals are contained in Part II - Supporting Documents of the Final Development Plan.

1.8 The Third Meeting of the Steering Committee held in Manila, Philippines in May 27-30, 1968, considered the Refined Development Plan and approved the plan after suggesting some modifications.

D. Interim Center (First Phase) 1 July 1968 - 30 June 1969.

A funding plan for the Center was developed by the Ministry of Education, Malaysia. Based on this funding plan the Refined Development Plan was further modified resulting in the Final Development Plan of the Center.

In August 1968 the Malaysian Government organized courses in integrated Science and Nuffield Biology, Chemistry and Physics courses. Nineteen participants from SEAMEC countries attended these courses with their Malaysian colleagues.

The Fourth Meeting of the Steering Committee held in Bangkok, Thailand on Nov. 7-9, 1968, approved the Final Development Plan of the Center.

The Fourth Meeting of the SEAMEC - Jakarta, January 1969 approved the revised plan.

The Fifth Meeting of the Steering Committee held in Tokyo from March 31 - April 7, 1969, decided that to prepare for the final course to be offered by RECSAM, a Primary Science Planning Workshop be held in Manila on April 24-28, 1969.

Appendix H

BIBLIOGRAPHY OF RECSAM REPORTS *

1. A Preliminary Study Relative to a Proposed Regional Centre for Education in Science and Mathematics for South East Asia SEAMES/041.02/F3 dated June 7th, 1966.

2. Final Report - SEAMES Technical Workshop. SEAMES/TW/7 July 1966. Kuala Lumpur.

3. Presentation of the SEAMES Proposals SEAMES/TW/7 July 1966.

4. Final Reports of S.E.A. Ministers of Education Council Conferences.

   (i) 1st Conference - 30th November 1965 - Bangkok
   (ii) 2nd Conference - SEAMES/SMC/7 - November 25th - 28th, 1966.
   (iii) 3rd Conference - SEAMES/TMC/7 - February 6th - 8th, 1968.
   (iv) 4th Conference - SEAMES/TMC/7 - January 7th - 10th, 1969. Volume I & II

5. Reports of Steering Committee Meetings for the Regional Centre for Education in Science and Mathematics.

   (i) 1st Meeting - 23rd to 25th May, 1967 - SEAMES P5/SCMS/4
   (ii) 2nd " - 16th to 19th October, 1967 - Indonesia P5/SCMS/11
   (iii) 3rd " - 27th to 30th May, 1968 - Philippines P5/SCMS/13
   (iv) 4th " - 7th to 9th November, 1968 - Thailand P5/SCMS/15
   (v) 5th " - 31st March to 7th April, 1969 - Tokyo P5/SCMS/16

6. Reports of the Task Force Meetings for the Regional Centre for Education in Science and Mathematics.

   (i) 1st Meeting - June 28th - 30th, 1967 - P5/SCMS/6/TF/1
   (ii) 2nd " - September 16th - 18th, 1967 - P5/SCMS/6/TF/2
   (iii) 3rd " - April 30th to May 3rd, 1968 - P5/SCMS/TF/3

7. Reports of the National Seminars on Science and Mathematics held by:-

   (a) Indonesia - August 3 - 4, 1967
   (b) Malaysia - " 9 - 10, 1967
   (c) Philippines - " 20 - 21, 1967
   (d) Singapore - " 1 - 2, 1967
   (e) Thailand - " 9 - 10, 1967
   (f) Vietnam - " 10 - 12, 1967

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* Most of these reports are available directly from the RECSAM Project Office.

Appendix H (Cont'd)

8. Report of the Regional Seminar on Science and Mathematics held in Penang - September 13th - 15th, 1967.

9. Final Development Plan of the Regional Centre for Education in Science and Mathematics:

   (i) Part I Operation Plan - P5/SCMS/14 - November 1st, 1968.

   (ii) Part II Supporting Documents - P5/SCMS/14 - November 1st, 1968.

10. RECSAM Workshop Reports

   (i) Primary Science Planning Workshop - Manila
   June 24th - 28th, 1969.

   (ii) Primary Mathematics Planning Workshop - Penang
   June 30th - July 4th, 1969.

11. Newsletters: No. 1 - July, 1967.

   No. 2 - January, 1968.

   No. 3 - June, 1968.

   No. 4 - April, 1969.

Appendix I

REPORT DISTRIBUTION

(1) 1 copy to each participant.

(2) 2 copies to each member of the International Advisory Council

(3) 6 copies to US.AID/Bangkok.

(4) 20 copies to U.S. Embassy, Kuala Lumpur.

(5) 1 copy to each Steering Committee Member.

(6) 1 copy to each Project Director.

(7) 1 copy to each Task Force Member.

(8) 12 copies to each Chairman, National Coordinating Committee.

(9) 6 copies to British Council, Kuala Lumpur.

(10) 5 copies to Director of SEAMES, Bangkok.

(11) 1 copy to each Consultant.

(12) 7 copies to Permanent Secretary, Ministry of Education, Kuala Lumpur, Malaysia.

(13) 1 copy to Chief Education Adviser, - do -

(14) 1 copy to Deputy Permanent Secretary. - do -

(15) 1 copy to Chief Organiser (Science) - do -

(16) 6 copies to each Chairman, National Maths Seminar.

Appendix J

PRESS COMMUNIQUE

A Primary Science Planning Workshop was held in Manila by the Regional Centre for Education in Science and Mathematics for Southeast Asia in cooperation with the Republic of the Philippines.

Leading Primary Science Educators from five member countries in the Southeast Asia Ministers of Education Organization (SEAMEO) met from June 24 to June 28 to prepare plans for a course in modern elementary science education techniques to be offered to top level educational personnel at Penang, Malaysia, from April to June 1970.

Delegates attended from Indonesia, Malaysia, Philippines, Singapore, Thailand; the delegate from South Vietnam was unable to attend. In addition to the delegates, consultants from Ceylon and the United States were present. Mr. Aurelio Juele, Superintendent of Science Education (Philippines) was chairman of the Planning Workshop.

Undersecretary of Education Juan L. Manuel gave the opening address while Assistant Director Liceria B. Soriano gave the welcome address. Remarks were made by Dr. Dolores Hernandez, Director of the UP Science Education Center.

The Workshop produced a detailed description of the proposed course and came out with strong recommendations which, if implemented, will insure the course to be launched in April 1970.

The Workshop was formally closed with Dr. Narciso Albarracin, Director of Private Schools, giving the closing address.

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